ENVIRONMENTAL PROFESSIONALS

The WCM Group, Inc.

April 4, 2018

Ms. Yiling Zhang
Bureau of Evaluation and Planning
New Jersey Department of Environmental Protection
Mail Code 401-02
401 E. State Street, 2nd floor
Trenton, NJ 08625-0420

UPS OVERNIGHT
AIRBILL NUMBER
1Z07479R0190188989

Reference:
a. Cogen Technologies Linden Venture, L.P.; Linden, Union County New Jersey; Program Interest Number 41809; Permit Activity Number BOP150002
b. Air Quality Impact Analysis Modeling Report

Dear Ms. Zhang:

On behalf of Cogen Technologies Linden Venture, L.P. (Linden Cogen), reference a., The WCM Group, Inc. is submitting the enclosed Air Quality Impact Analysis Modeling Report.

The Air Quality Impact Analysis was conducted in accordance with the updated modeling protocol submitted December 4, 2017. Comments provided by the NJDEP in the conditional approval dated January 30, 2018 have been incorporated into the modeling report. Modeling files are provided on the diskette enclosed with this report.

If you have any questions, please contact Mr. Michael Hunt at your convenience at (281) 446-7070.

Sincerely,

Kerry Higgins

Kerry Higgins
Sr. Director, Technical Services

KSH/llb
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cc: N. Sesto (electronic)
B. Durham (electronic)
E. Kats, NJDEP (electronic)
EPA Region 2

LINDEN 7

PREVENTION OF SIGNIFICANT DETERIORATION AND TITLE V OPERATING PERMIT AIR QUALITY IMPACT ANALYSIS MODELING REPORT

Prepared for
COGEN TECHNOLOGIES LINDEN VENTURE, L.P.
LINDEN, UNION COUNTY, NEW JERSEY

Prepared by
THE WCM GROUP, INC.
Humble, Texas

April 2018

INTRODUCTION

Cogen Technologies Linden Venture, L.P. (Linden Cogen) operates a cogeneration facility located within the Phillips 66 Bayway Refinery (Refinery) in Linden, Union County, New Jersey. The proposed Linden 7 project (Project) will add one GE 7F.05 combustion turbine and unfired HRSG on a 3.2-acre plot located within the Refinery in the vicinity (i.e., approximately 800 feet west-southwest) of the existing cogeneration facility. The Linden 7 combustion turbine will fire natural gas as the primary fuel. Ultra-low sulfur distillate (ULSD) fuel oil will be utilized as the back-up fuel for up to 800 hours per year. Other emissions sources at the proposed facility will include a 526,000-gallon ULSD fixed roof storage tank, electrical equipment insulated with sulfur hexafluoride (SF_6), and equipment leak fugitive emissions associated with piping components in natural gas, ULSD, aqueous ammonia, and ammonia vapor service. There will also be an 8,000-gallon aqueous ammonia horizontal, low pressure storage tank. The aqueous ammonia storage tank will be a closed loop system so there will be no emissions associated with the aqueous ammonia storage tank.

Maximum estimated criteria pollutant emissions for the Project are summarized in the table below.

Summary of Project Annual Emissions

Pollutant	Proposed Project Emissions	Significant Net Emissions Increase Levels[1]	PSD/NNSR Review Applies?
	tons/yr	tons/yr	
NO_X[2]	87.60	40 (25)	Yes[3]
CO	80.16	100	No
TSP	54.55	25	Yes
$PM_{2.5}$	62.61	10	Yes
PM_{10}	62.61	15	Yes
SO_2	12.22	40	No
VOC	20.29	40 (25)	No
Ozone (as NO_X or VOC)	87.60 / 20.29	40	Yes
Lead	0.01	0.6	No
Sulfuric Acid	7.53	7	Yes

Pollutant	Proposed Project Emissions	Significant Net Emissions Increase Levels[1]	PSD/NNSR Review Applies?
	tons/yr	tons/yr	
H_2S	0.00	10	No
Fluorides (except HF)	0.00	3	No
Ammonia	73.47	---	---

1 Significant net emissions increase levels based on 40 CFR 52.21(b)(23)(i) and Table 3 of N.J.A.C. 7:27-18.7.
2 Nitrogen dioxide (NO_2) is the compound regulated as a criteria pollutant; however, the PSD threshold level is based on the sum of all oxides of nitrogen (NO_X).
3 Because the project will be located in a nonattainment area for ozone and the significant net emissions increase level (25 TPY) will be exceeded, nonattainment review applies.

The Project will be located in Union County, an area that is currently classified as attainment for sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter with an aerodynamic diameter less than 10 micrometers (µm) (PM_{10}), particulate matter with an aerodynamic diameter less than 2.5 µm ($PM_{2.5}$), and lead (Pb). The existing Linden Cogen facility is a major stationary source pursuant to Prevention of Significant Deterioration (PSD) requirements. The Project is considered a significant modification of an existing major source due to Linden Cogen's common control of both facilities. PSD review is required for each regulated pollutant for which the project's net emissions increase exceeds its significant emission rate (SER). Based on the proposed emissions, the Project is subject to PSD review for each of the following pollutants: oxides of nitrogen (NO_X), total suspended particulates (TSP), PM_{10}, $PM_{2.5}$, sulfuric acid mist (H_2SO_4), and greenhouse gases (GHG).

Union County is included in the New York-Northern New Jersey-Long Island (NY-NJ-CT) nonattainment area (NYC Area) which is designated as moderate non-attainment for the 8-hour ozone standard. NO_X and volatile organic compounds (VOC) are both regulated as precursors to ozone, and are considered in the Non-Attainment New Source Review (NNSR) (N.J.A.C. 7:27-18) applicability evaluation. The Project emissions increases for each regulated pollutant are compared to the respective NNSR significant emission rate to determine NNSR applicability. The emissions increase for NO_X exceed the 25 tons per year (tpy) significant net emission increase level. Therefore, the Project is subject to NNSR for NO_X.

An ambient air quality analysis was performed to demonstrate that emissions increases due to the Project will not cause or contribute to off-property (i.e., land beyond the fence surrounding the tract of land located within the refinery on which the Linden 7 project will be located) ground level concentrations in excess of the Prevention of Significant Deterioration (PSD) increments as required in New Jersey Administrative Code, Title 7, Chapter 27 Subchapter 8, Section 7:27-8.5 (N.J.A.C. 7:27-8.5). As specified in paragraph N.J.A.C. 7:27:8.5(a)(2), modeling is required for preconstruction permit applications which propose an emission increase that subjects them to

N.J.A.C. 7:27-18 (Emissions Offsets Rule for nonattainment areas). In addition, proposed new sources subject to PSD review may not cause or significantly contribute to a violation of the National Ambient Air Quality Standards (NAAQS) or the New Jersey Ambient Air Quality Standards (NJAAQS).

As part of this demonstration, the United States Environmental Protection Agency (USEPA) and New Jersey Department of Environmental Protection (NJDEP) have established Significant Impact Levels (SILs) for all of the criteria pollutants. SILs represent concentrations of pollutants that are considered to be insignificant with respect to demonstration of NAAQS compliance. By definition, proposed new sources whose air quality impacts are less than SILs neither cause nor significantly contribute to NAAQS or NJAAQS violations. Proposed new sources whose air quality impacts exceed the SILs must complete a cumulative analysis taking into consideration existing background air quality levels and contributions from other sources. As shown in table below, the maximum predicted impact for each criteria pollutant is less than its respective SIL for each applicable averaging period. The modeling results are discussed in Section 11.0

Summary of Project Modeled Impacts

Criteria Pollutant	Averaging Period	Maximum Predicted Impact	Significant Impact Level	Background	Total Concentration	NAAQS/NJAAQS
		(μg/m³)	(μg/m³)	(μg/m³)	(μg/m³)	(μg/m³)
NO_2	1-Hour	7.29	7.5(1)	122.6	129.9	188
	Annual	0.096	1	41.5	41.6	100
CO	1-Hour	179	2,000	3,220	3,399	40,000
	8-Hour	132	500	2,070	2,202	10,000
SO_2	1-Hour	0.670	7.8(1)	31.4	32.1	196
	3-Hour	0.614	25	55.0	55.6	1,300
	24-Hour	0.257	5	13.1	13.4	365
	Annual	0.0134	1	1.6	1.6	80
$PM_{2.5}$	24-Hour	1.03	1.2(2)	24	25.0	35
	Annual	0.0686	0.2(2)	9.9	10.0	12
PM_{10}	24-Hour	3.93	5	40	43.9	150

1 Interim SIL

2 24-hour and annual SILs for $PM_{2.5}$ have been vacated. See Section 10.8 for discussion.

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ATTACHMENTS

1.0 PROJECT IDENTIFICATION INFORMATION

APPLICANT:	Cogen Technologies Linden Venture, LP P.O. Box 4400 Linden, New Jersey 07036 Ms. Natalie Sesto EHS Manager (908) 523-4320 Natalie.Sesto@naes.com
TECHNICAL CONTACT:	Mr. Kerry Higgins The WCM Group, Inc. P.O. Box 3247 Humble, Texas 77347-3247 (281) 446-7070 khiggins@wcmgroup.com
FACILITY:	Railroad Avenue Linden, New Jersey Union County
PERMIT NUMBER:	BOP150002
FACILITY ID:	41809
APPLICANT'S MODELER:	The WCM Group, Inc. (WCM) P.O. Box 3247 Humble, Texas 77347-3247 (281) 446-7070

2.0 PROJECT DESCRIPTION

2.1 PROCESS OVERVIEW

Linden Cogen operates a cogeneration facility located within the Refinery in Linden, Union County, New Jersey. The facility currently consists of five (5) General Electric (GE) Frame 7EA combustion turbines (Linden 5) each equipped with a supplementary fired heat recovery steam generator (HRSG), and one (1) GE 7FA combustion turbine and unfired HRSG (Linden 6) that was constructed later adjacent to Linden 5. The existing Linden 5 and Linden 6 are authorized under Operating Permit BOP150002. There are no changes being proposed to the existing Linden 5 and Linden 6 in this application.

The Project will add one GE 7F.05 combustion turbine and unfired HRSG on a 3.2 acre plot located within the Refinery in the vicinity of the existing cogeneration facility. The Linden 7 combustion turbine will generate electric power for sale to the electrical grid. The HRSG will recover heat to generate high pressure (HP) steam for utilization in the cogeneration facility's existing three (3) steam turbines located in the existing plant. The steam turbines will utilize the HP steam to produce electrical power and deliver intermediate pressure (IP) and low pressure (LP) steam to the Refinery. The Project will utilize existing ancillary equipment associated with Linden 5 and Linden 6, including, but not limited to, the steam turbines, air cooled condenser, water treatment equipment, and diesel-fired fire water pump engine. Figure 1 shows a plot plan of the proposed facility. Figure 2 shows an area map of the general area.

In addition to the combustion turbine and HRSG, the Project will also include the construction of ancillary equipment including, but not limited to:

- One (1) ULSD storage tank and piping components in ULSD service;
- One (1) aqueous ammonia storage tank and piping components in aqueous ammonia and ammonia vapor service;
- One (1) demineralized water storage tank;
- One (1) waste water storage tank;
- One (1) oil/water separator;
- One (1) fin fan cooling water module;
- Associated electric transmission and distribution equipment; and
- Maintenance, warehouse and office buildings.

The Project will utilize the existing facility's diesel-fired fire water pump engine (Emission Unit U9) authorized by Operating Permit BOP150002.

2.2 COGENERATION CYCLE COMBUSTION TURBINE

The proposed combustion turbine is a GE Frame 7F.05 that will fire as the primary fuel. Ultra-low sulfur distillate (ULSD) fuel oil will be utilized as the back-up fuel for up to 800 hours per year. The maximum heat input for the combustion turbine is 2,517 million British thermal units per hour (MMBtu/hr) when firing natural gas based on the higher heating value (HHV) of the fuel, and 2,601 MMBtu/hr when firing ULSD based on the HHV of the fuel. The combustion turbine will be authorized to operate up to 8,760 full-load hours per year, but may operate at partial loads.

Ambient air will be drawn through an air filtration intake structure then into the inlet compressor section of the combustion turbine. Inlet air will be cooled using an evaporative cooler at higher ambient temperatures, which will improve efficiency and increase output. After compression, the air will be mixed with natural gas or ULSD fuel and burned in the combustors, which will exhaust the hot gas through rows of stationary vanes and rotating blades. These hot exhaust gas will turn the turbine and drive a generator to produce electric power for distribution. The exhaust gas from the combustion turbine will then pass through an unfired HRSG where boiler feed water will be converted into steam for utilization in the cogeneration facility's existing three (3) steam turbines located in the existing plant.

The proposed combustion turbine will be equipped with dry-Low NO_X (DLN) combustors to control NO_X emissions while firing natural gas. Water injection will be to reduce NO_X emissions while firing ULSD. In addition, the HRSG package will include a selective catalytic reduction (SCR) system to provide additional control of NO_X emissions, and an oxidation catalyst designed to reduce CO and VOC emissions. Good combustion practices and use of clean burning fuels will minimize SO_2, H_2SO_4, particulate matter (TSP, PM_{10} and $PM_{2.5}$), and VOC emissions.

2.3 ANCILLARY EQUIPMENT

Ancillary equipment will include electrical equipment insulated with SF_6, piping components in natural gas, ULSD, aqueous ammonia, and ammonia vapor service, and the following insignificant emissions sources: ULSD storage and aqueous ammonia storage.

Electrical Equipment Insulated with SF_6

The Project will include a total of three (3) new circuit breakers insulated with SF_6. The breakers will contain approximately 660 pounds of SF_6.

ULSD Storage Tank

ULSD used as the back-up fuel for the combustion turbine will be stored on-site in a 526,000 gallon fixed roof storage tank. There will be a direct supply piping into the storage tank from the

Refinery. The ULSD storage tank will be considered an insignificant source since the vapor pressure of the liquid stored will be less than 0.02 pounds per square inch absolute (psia) at the liquid's actual temperature or at 70°F, whichever temperature is greater.

Aqueous Ammonia Storage Tank

Aqueous ammonia used in the SCR system will be stored on-site in an 8,000 gallon horizontal, low pressure storage tank. The ammonia content in the aqueous ammonia will not exceed 30%. The ammonia supply will be drawn from the existing 70,000 gallon ammonia storage tank located at Linden 5. The aqueous ammonia will be pumped from the storage tank to a vaporizer then to an ammonia injection grid via aboveground piping. The ammonia will be injected through a series of nozzles into the exhaust gas stream within the HRSG, just upstream of the SCR catalyst. The aqueous ammonia storage tank will be considered an insignificant source since the storage tank capacity will not exceed 10,000 gallons

3.0 REGULATORY REQUIREMENTS

The Project will comply with applicable federal and New Jersey air quality regulations. The facility will emit several criteria pollutants for which standards have been set. The air pollutants that will be emitted and the federal and state regulations are discussed in this section. National Ambient Air Quality Standards (NAAQS), Significant Impacts Levels (SILs), Significant Monitoring Concentrations, and Prevention of Significant Deterioration (PSD) Increments are provided in Table 3-1 below.

Table 3-1
National Ambient Air Quality Standards

Pollutant	Averaging Period	Significant Impact Level ($\mu g/m^3$)	Significant Monitoring Concentration ($\mu g/m^3$)	Primary NAAQS ($\mu g/m^3$)	Secondary NAAQS ($\mu g/m^3$)	Class II Increment ($\mu g/m^3$)
NO_2	1-Hour	7.5(1)	---	188 (100 ppb)	---	---
	Annual	1	14	100 (53 ppb)	100 (53 ppb)	25
CO	1-Hour	2,000	---	40,000 (35 ppm)	---	---
	8-Hour	500	575	10,000 (9 ppm)	---	---
PM_{10}	24-Hour	5	10	150	150	30
	Annual	1	---	---	---	17
$PM_{2.5}$	24-Hour	1.2(2)	0	35	35	9
	Annual	0.2(2)	---	12	15	4
SO_2	1-Hour	7.8(1)	---	196 (75 ppb)	---	---
	3-Hour	25	---	---	1,300 (0.5 ppm)	512
	24-Hour	5	13	365 (0.14 ppm)	---	91
	Annual	1	---	80 (30 ppb)	---	20
Lead	Rolling 3-month average	---	0.1	0.15	0.15	---

Pollutant	Averaging Period	Significant Impact Level (μg/m³)	Significant Monitoring Concentration (μg/m³)	Primary NAAQS (μg/m³)	Secondary NAAQS (μg/m³)	Class II Increment (μg/m³)
Ozone(3)	8-Hour (2015)	1.97 (1 ppb)	---	137 (70 ppb)	137 (70 ppb)	---

1 Interim SIL.

2 24-hour and annual SILs for $PM_{2.5}$ have been vacated. See Section 10.8 for discussion.

3 The Project will not emit ozone, but rather NO_X and VOC, which are ozone precursors.

Table 3-2
New Jersey Ambient Air Quality Standards

Pollutant	Averaging Period[1]	Primary Standard (μg/m³)	Secondary Standard (μg/m³)
NO_2	12-Month	100	100
CO	1-Hour	40,000	40,000
	8-Hour	10,000	10,000
Total Suspended Particulates (TSP)	24-Hour	260	150
	12-Month	75	60
SO_2	3-Hour	---	1,300
	24-Hour	365	260
	12-Month	80	60
Lead (Pb)	3-Month	1.5	1.5
Ozone[2]	1-Hour	235	160

1 All short-term (1-hour, 3-hour, 8-hour, and 24-hour) standards except ozone are not to be exceeded more than once per 12 month period; 3-month and 12-month standards are never to be exceeded. All short-term averages are calculated as running or moving averages. The 12-month TSP standards are geometric means.

2 The 1-hour ozone standard should not be exceeded more than an average of one day per year over three years.

3.1 POLLUTANTS EVALUATED

The pollutants being evaluated to determine maximum ground level impacts are the NAAQS and NJAAQS - NO_2, CO, SO_2, TSP, PM_{10}, $PM_{2.5}$, and lead (Pb). In addition, all air toxics identified as Hazardous Air Pollutants (HAPs) in N.J.A.C. 7:27-8 & 22[1] that are included in a permit application will be evaluated in the corresponding risk assessment. Greenhouse gases (GHG) are subject to PSD review; however, there are no standards with which to evaluate ground level impacts of GHG. Therefore, an analysis of impacts of GHG is not required. Net emissions increases of 100 tons per year (tpy) or more of NO_X or VOCs (precursors of ozone) are subject to an ambient ozone impact analysis. Net emissions increases of both NO_X and VOCs are less than 100 tpy so an ambient ozone impact analysis is therefore not required.

3.2 TYPES OF MODELING ANALYSES

The Project will be located in Union County which is part of the New York-Northern New Jersey-Long Island, NY-NJ-CT Nonattainment Area (NYC Area). This area is currently classified as moderate nonattainment with respect to the 1997 8-hour ozone standard and marginal nonattainment with respect to the 2008 8-hour ozone standard. Union County is currently designated as in attainment or unclassified for the remaining criteria pollutants (NO_2, SO_2, CO, PM_{10}, $PM_{2.5}$, and Pb). Since this is a new facility, all facility sources of emissions of concern are included in the air quality impact analyses.

The air quality impact analyses that were performed include the following:

1. Review of compliance with Prevention of Significant Deterioration Increment Standards for NO_2, PM_{10}, and $PM_{2.5}$ (PSD Air Quality Analysis);
2. Review of compliance with National and New Jersey Ambient Air Quality Standards (NAAQS Analysis) for NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$, and Pb;
3. Review of the potential for health effects resulting from emissions of non-criteria pollutants (State Risk Screening) (e.g., NH_3, lead, etc.); and
4. Class I Area impact analysis.

3.2.1 PSD Air Quality Analysis

NO_X, PM_{10}, $PM_{2.5}$, and H_2SO_4 exceed the PSD emission threshold limits and require a PSD air quality analysis. There are PSD increment consumption limits for NO_2, PM_{10}, and $PM_{2.5}$; there are no PSD increment consumption limits for H_2SO_4. As shown in Section 11.2.1, the maximum predicted annual NO_2 concentration from the Project does not

[1] HAPS reporting thresholds have been revised and are now included in N.J.A.C. 7:27-17. The amended rule was operative on February 12, 2018. The revised reporting thresholds are not applicable since the NJDEP applies the rules that are operative at the time that the application is submitted [49 N.J.R. at 2381].

exceed its Significant Impact Level (SIL). In addition, neither the maximum predicted 24-hour and annual PM_{10} impacts (Section 11.2.5) or the maximum modeled 24-hour and annual $PM_{2.5}$ impacts (Section 11.2.4) exceed their respective SILs. Therefore, a multisource PSD increment consumption modeling analysis is not necessary for NO_2, PM_{10}, or $PM_{2.5}$.

3.2.2 NAAQS Analysis

A federal/state NAAQS analysis is required for NO_2, TSP, PM_{10}, $PM_{2.5}$, CO, SO_2, and Pb. As shown in Section 11.2.2, the maximum predicted CO concentrations resulting from the Project do not exceed the 1-hour or 8-hour SILs for CO. Therefore, a full CO NAAQS analysis with off-property CO sources is not required. As previously discussed, the maximum annual NO_2 impact does not exceed its SIL. Therefore, a full annual NO_2 NAAQS analysis with off-property NO_X sources is not required. In addition, the maximum predicted 1-hour NO_2 impact resulting from Project sources of NO_X emissions does not exceed its SIL. Therefore, a full 1-hour NO_2 NAAQS analysis with off-property sources is not required. Also, as previously discussed, the maximum 24-hour PM_{10} impact does not exceed its SIL. Therefore, a full 24-hour PM_{10} NAAQS analysis with off-property sources is not required. Lastly, as previously discussed, the maximum 24-hour and annual $PM_{2.5}$ impacts do not exceed their respective SILs. Therefore, a full 24-hour and a full annual $PM_{2.5}$ NAAQS analysis with off-property sources is not required.

NO_X and VOC are both regulated as precursors to ozone, and are considered in the Non-Attainment New Source Review (NNSR) (N.J.A.C. 7:27-18) applicability evaluation. Modifications with emissions increases greater than 25 tpy NO_X or VOC are subject to NNSR. The emissions increases for NO_X are greater than the significant emission rate and are therefore subject to NNSR as a precursor to ozone. Therefore, the facility will be required to obtain NO_X emission offsets from other sources that impact the same area as the proposed source.

3.2.3 State Risk Screening

All air toxics identified as Hazardous Air Pollutants (HAPs) in N.J.A.C. 7:27-8 & 22 that are included in a permit application must be evaluated in the corresponding risk assessment. The proposed combustion turbine will potentially emit air toxics above their respective reporting thresholds pursuant to Subchapter 22, Appendix Table B. Thirteen (13) compounds will be emitted from the combustion turbine at levels that exceed their respective reporting thresholds. These compounds are acrolein, ammonia, arsenic (inorganic), benzene, 1,3-butadiene, cadmium, formaldehyde, lead, mercury, PAH (benzo(a)pyrene is used as a surrogate), selenium, sulfuric acid, and toluene. Each of the thirteen (13) compounds were evaluated for their long-term (annual) risk screening effects.

Nine (9) of the compounds (acrolein, ammonia, arsenic, benzene, 1,3-butadiene, formaldehyde, lead, sulfuric acid, and toluene) have short-term reference concentrations and these nine compounds were evaluated for their short-term risk screening effects.

Maximum estimated emission rates for the thirteen (13) air toxics are summarized in the table below.

Table 3-3
Summary of Facility-Wide HAP/TAP Emissions

Air Toxic	Linden 7		Reportable Limit
	(lb/hr)	(tpy)	(tpy)
Acrolein	0.0161	0.0706	0.004
Ammonia	18.70	73.43	N/A
Arsenic (inorganic)	0.0286	0.0114	0.0005
Benzene	0.1430	0.0899	0.01[1]
Benzo(a)pyrene (used as surrogate for PAH)	0.104	0.0637	0.0010
1,3-Butadiene	0.0416	0.0210	0.0070
Cadmium	0.0125	0.0050	0.0010
Formaldehyde	0.728	2.0545	0.2000
Lead	0.0240	0.0096	0.0010
Mercury	0.00312	0.0012	0.0010
Selenium	0.0650	0.0260	0.0100
Sulfuric Acid	3.10	7.53	N/A
Toluene	0.327	1.4333	1.0000

[1] Benzene is classified as a toxic substance (TXS) with a reporting threshold of 0.01 lb/hr

A refined ambient air risk screening analysis was performed to demonstrate that emissions of acrolein, ammonia, arsenic, benzene, benzo(a)pyrene (used as a surrogate for PAH), 1,3-butadiene, cadmium, formaldehyde, lead, mercury, selenium, sulfuric acid, and toluene from the Project will not cause off-property concentrations in conjunction with respective unit risk factors and/or reference dose concentrations that exceed the Incremental Risk thresholds. In addition, the Level 2 refined risk screening analysis shows that emissions of acrolein, ammonia, arsenic, benzene 1,3-butadiene, formaldehyde, lead, sulfuric acid, and toluene in conjunction with their reference concentrations will not generate off-property concentrations in excess of their respective short-term reference concentrations. The risk screening analyses are provided in Section 11.4

3.2.4 Class I Area Impact Analysis

The closest Class I area to the proposed location of the Project is the Brigantine - Edwin B. Forsythe National Wildlife Refuge area located near Atlantic City, New Jersey. This wildlife refuge area is approximately 130 kilometers from the proposed project location.

Since the distance between the nearest Class I area and the Project is greater than 50 kilometers (km), a screening approach is used to determine whether an Air Quality Related Values (AQRV) review is required for the project. "The Federal Land Managers AQRV Workgroup (FLAG) Phase I Report – Revised (FLAG 2010)" provides that if a facility's total SO_2, NO_X, PM_{10}, and H_2SO_4 annual emissions (in tons per year, based on 24-hour maximum allowable emissions) divided by the distance between the facility and the Class I area (in kilometers) is less than 10, then it is considered to have negligible impacts with respect to Class I AQRVs and an AQRV review is not required. For the Project, this is conservatively determined as:

$$\frac{Q}{distance}$$

$$= \left. \begin{matrix} \left(SO_2 \times 24\frac{hr}{d} \times 365\frac{d}{yr} \times \frac{ton}{2{,}000\ lb}\right) + \left(NO_x \times 24\frac{hr}{d} \times 365\frac{d}{yr} \times \frac{ton}{2{,}000\ lb}\right) + \\ \left(PM_{10} \times 24\frac{hr}{d} \times 365\frac{d}{yr} \times \frac{ton}{2{,}000\ lb}\right) + \left(H_2SO_4 \times 24\frac{hr}{d} \times 365\frac{d}{yr} \times \frac{ton}{2{,}000\ lb}\right) \end{matrix} \right/ distance$$

Where:

SO_2	=	maximum 24-hour hourly average SO_2 emission rate	= 4.80 lb/hr;
NO_X	=	maximum 24-hour hourly average NO_X emission rate	= 45.71 lb/hr;
PM_{10}	=	maximum 24-hour hourly average PM_{10} emission rate	= 49.17 lb/hr; and
H_2SO_4	=	maximum 24-hour hourly average H_2SO_4 emission rate	= 3.10 lb/hr.

$$= \frac{\left((SO_2 + NO_X + PM_{10} + H_2SO_4) \times 24\ \frac{hr}{d} \times 365\ \frac{d}{yr} \times \frac{ton}{2{,}000\ lb}\right)}{distance}$$

$$= \frac{\left(\left(4.80\ \frac{lb}{hr} + 45.71\ \frac{lb}{hr} + 49.17\ \frac{lb}{hr} + 3.10\ \frac{lb}{hr}\right) \times 24\ \frac{hr}{d} \times 365\ \frac{d}{yr} \times \frac{ton}{2{,}000\ lb}\right)}{130\ km}$$

$$= \frac{450 \frac{tons}{yr}}{130\, km} = 3.46 \frac{tons}{km - yr}$$

The maximum 24-hour hourly average emission rates are based on the maximum hourly emission rates listed in Table 5-1, except NO_X. The maximum 24-hour hourly average NO_X emission is based on 3-hours of cold start emissions with natural gas (82.86 lb/hr) followed by 21 hours of steady state emissions firing distillate oil at 100% load during low ambient temperatures (40.40 lb/hr).

Therefore, since Q/distance (3.46) is well below 10, an AQRV review is not required.

A description of the proposed major modification and the AQRV screening demonstration were sent to the Federal Land Manager. Linden Cogen has received concurrence from both the National Park Service (NPS) Air Resources Division (ARD) and Fish & Wildlife Service (FWS) Air Quality Branch (AQB) that no additional Class I analysis will be necessary. This correspondence is included in this report as Attachment A.

4.0 FACILITY SITE CHARACTERISTICS

4.1 FACILITY SITE CHARACTERISTICS

The Project will be located on a 3.2-acre tract of land located within the Refinery in Linden, Union County, New Jersey. The land use surrounding the facility is predominantly heavy industrial with some compact residential areas. The Universal Transverse Mercator (UTM) coordinates (NAD83) for the proposed stack are 565,997 meters east and 4,498,129 meters north, zone 18. The land surrounding the proposed project location is typically flat. The site elevation is approximately 7 feet above sea level. Within 3,000 meters, the highest elevations are generally no more than about 35 feet above sea level. The lowest elevations are approximately 0 feet above sea level along the Arthur Kill to the east of the facility. Some ground surface elevations beyond a distance of 4.5 miles from the facility reach heights greater than 190 feet above mean sea level (MSL). A facility plot, aerial photograph, and site location map plan are provided as Figures 1, 2 and 3, respectively.

Union County is located in the NYC Area, which is currently classified as moderate nonattainment with respect to the 1997 8-hour ozone standard and marginal nonattainment with respect to the 2008 8-hour ozone standard. Union County is currently designated as in attainment or unclassified for the remaining criteria pollutants (NO_2, SO_2, CO, PM_{10}, $PM_{2.5}$ and Pb).

4.2 GOOD ENGINEERING PRACTICE (GEP) STACK HEIGHT ANALYSIS

To determine the turbulent effect of nearby structures on the emission sources, a Good Engineering Practice (GEP) stack height analysis has been performed. This analysis was conducted using the dimensions and coordinates for on-site structures. There are no nearby off-site structures that have the potential to affect dispersion. Section 4.2.1 discusses in detail the methodology that was used to perform the GEP stack height analysis and determine the downwash parameters. The proposed buildings to be constructed on-site, along with their dimensions, are identified on the facility plot plan (see Figure 1).

AERMOD does not consider downwash for area or volume sources. Therefore, a downwash analysis will not be performed for these sources, if any are modeled.

4.2.1 Good Engineering Practice Stack Height

Section 123 of the Clean Air Act Amendments required EPA to promulgate regulations to assure that the control of any air pollutant under an applicable State Implementation Plan (SIP) was not affected by 1) stack heights that exceed GEP or 2) any other dispersion technique. The USEPA provides specific guidance for determining GEP stack height and for determining whether building downwash will occur in the Guidance for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations), (EPA-450-4-80-023R, June, 1985). GEP is defined as "the height necessary to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies, and wakes that may be created by the source itself, or nearby structures, or nearby terrain obstacles."

The GEP definition is based on the observed phenomena of atmospheric flow in the immediate vicinity of a structure. It identifies the minimum stack height at which significant adverse aerodynamics (downwash) caused by nearby structures are avoided.

The GEP stack height for a given structure is calculated in the following manner:

$$H_{GEP} = H_B + 1.5L \qquad \text{Eqn. 1}$$

where:
- H_{GEP} = GEP stack height;
- H_B = The height of adjacent or nearby structure; and
- L = The lesser dimension (height or projected width) of the adjacent or nearby structure.

The projected width of a structure is calculated using the formula:

$$PW = \sqrt{(l^2 + w^2)} \qquad \text{Eqn. 2}$$

where:
- PW = Projected width;
- l = Length of the structure; and
- w = Width of the structure

The maximum projected width of a cylindrical tank is the diameter of the tank.

Table 4-1 presents structure parameters for on-site structures. In addition, “L” (i.e., lesser dimension [height or projected width] of the adjacent or nearby structure), “5L,” distance from the nearest point of the structure to the stack, and GEP stack heights are given for each structure.

TABLE 4-1
Structure Characteristics

Structure	Figure 1 ID	Height (ft)	Length (ft)	Width (ft)	L (ft)	5L (ft)	Distance to Stack (ft)	GEP (ft)
HRSG 1	**2**	**78.17**	**40**	**9.5**	**41.11**	**205**	**7**	**139.8**
HRSG 2	**2**	**75**	**26**	**19**	**32.20**	**161**	**38**	**123.3**
HRSG 3	**2**	**78.17**	**26**	**11**	**28.23**	**141**	**59**	**120.5**
Blowdown Tank	4	20	7		7	35	106	30.5
Guard House	6	10	8	8	10	50	342	25
Air Inlet Filter House	**7**	**75**	**45.33**	**3.75**	**45.5**	**228**	**217**	**143.2**
PDC Building	12	12	42	15	12	60	235	30
Fuel Oil Storage Tank	18	58	40		35	175	199	118
Fin Fan	**20**	**30**	**65.83**	**38**	**30**	**150**	**132**	**75**
CEMS Building	**21**	**12**	**10**	**10**	**12**	**60**	**9**	**30**
Instrument Air Enclosure	24	10	10	4	10	50	92	25
Control/Admin/Warehouse / Maintenance Building	32/36	24	85	30	24	120	366	60
Demin Water Storage Tank	37	50	42		42	210	223	113
Ammonia Storage Tank	38	6	10	6	6	30	98	15
Fire Protection/Foam Building	46	10	35	25	24	120	183	60
Existing Control Building	---	16	52.5	52.5	16	80	364	40
Existing Tank 52	**---**	**35**	**35**		**35**	**175**	**86**	**87.5**

The Linden combustion turbine stack is 190 feet tall. A comparison of the stack heights with the GEP stack height of each structure indicates that the height of the combustion turbine stack is significantly greater than the GEP height of all nearby structures. However, any structure located within 5L of the stack (shown in **bold** text in Table 4-1) was included as a potential downwash structure in the EPA downwash program, BPIPPRM. The downwash parameters generated by BPIPPRM were input along with the source in AERMOD.

4.3 URBAN/RURAL DETERMINATION

There are two methods that can be used to determine the dispersion coefficient (rural or urban) to use in the modeling exercise for the sources. One method uses an Auer Land Use analysis to determine the dispersion coefficient. The other method uses the population density of the area. Both methods are discussed below.

4.3.1 Land Use Analysis

The land use in the vicinity of the Project was evaluated according to the Auer land use analysis method to determine the proper dispersion coefficient for modeling. For an Auer land use analysis, at least 50 percent of the land use must be of Category I1, I2, C1, R2 or R3, according to Table 4-3, in order for the area to be considered urban in nature.

TABLE 4-3
IDENTIFICATION AND CLASSIFICATION OF LAND USE TYPES FOR AUER LAND USE ANALYSIS

Type	Description		
	Use	Structures	Vegetation
I1	Heavy Industrial	Major chemical, steel and fabrication industries; generally 3-5 story buildings, flat roofs	Grass tree growth extremely rare; <5% vegetation
I2	Light-Moderate Industrial	Rail yards, truck depots, warehouses, industrial parks, minor fabrications; generally 1-3 story buildings, flat roofs	Very limited grass, trees almost total absent; <5% vegetation
C1	Commercial	Office and apartment buildings, hotels; >10 story heights, flat roofs	Limited grass and trees; <15% vegetation
R1	Common Residential	Single family dwelling with normal easements; generally one story, pitched roof structures; frequent driveways	Abundant grass lawns and light-moderately wooded; >70% vegetation
R2	Compact Residential	Single, some multiple, family dwelling with close spacing; generally <2 story, pitched roof structures; garages (via alley), no driveways	Limited lawn sizes and shade trees; <30% vegetation

Type	Description		
	Use	Structures	Vegetation
R3	Compact Residential	Old multi-family dwellings with close (<2 m) lateral separation; generally 2 story, flat roof structures; garages (via alley) and ashpits, no driveways	Limited lawn sizes, old established shade trees; <35% vegetation
R4	Estate Residential	Expansive family dwelling on multi-acre tracts	Abundant grass lawns and lightly wooded; >80% vegetation
A1	Metropolitan Natural	Major municipal, state or federal parks, golf courses, cemeteries, campuses; occasional single-story structures	Nearly total grass and lightly wooded; >95% vegetation
A2	Agricultural Rural	-----	Local crops (e.g., corn, soybean); >95% vegetation
A3	Undeveloped	Uncultivated; wasteland	Mostly wild grasses and weeds, lightly wooded; >90% vegetation
A4	Undeveloped Rural	-----	Heavily wooded; >95% vegetation
A5	Water Surfaces	Rivers, lakes	-----

The EPA program AERSURFACE was executed to determine land use in the vicinity of the Project. Table 4-4 presents the results of the AERSURFACE execution for surface roughness based on a 3-kilometer radius circle centered on the combustion turbine stack. AERSURFACE uses 1992 National Land Cover Database (NLCD) data that is based on 21 land use categories. Table 4-4 also presents the data as representative of rural or urban classification. Figure 4 shows the land use by Auer Land Use Categories.

TABLE 4-4
LAND USE DETERMINED BY AERSURFACE

Category	Description	AERSURFACE Units	AUER Category	Classification	
				Rural	Urban
0	Missing, Out-of-Bounds, or Undefined	0	---		
11	Open Water	2,665	A5	2,665	
12	Perennial Ice/Snow	0		0	
21	Low Intensity Residential	6,400	R1	6,400	
22	High Intensity Residential	4,131	R2/R3		4,131
23	Commercial/Industrial/Transp	11,285	I1/I2/C1		11,285
31	Bare Rock/Sand/Clay	0		0	
32	Quarries/Strip Mines/Gravel	8	C1		8

Category	Description	AERSURFACE Units	AUER Category	Classification	
				Rural	Urban
33	Transitional	0		0	
41	Deciduous Forest	2,277	A4	2,277	
42	Evergreen Forest	10	A4	10	
43	Mixed Forest	948	A4	948	
51	Shrubland	0		0	
61	Orchards/Vineyard/Other	0		0	
71	Grasslands/Herbaceous	0	A3	0	
81	Pasture/Hay	92	A2	92	
82	Row Crops	80	A2	80	
83	Small Grains	0	A2	0	
84	Fallow	0		0	
85	Urban/Recreational Grasses	873	A1	873	
91	Woody Wetlands	561	A4/A5	561	
92	Emergent Herbaceous Wetlands	2,039	A3/A5	2,039	
Totals		31,369		15,945	15,424
				50.8%	49.2%

As shown in Table 4-4, 49.2 percent of the land use within 3 kilometers of the Project location is classified as urban based on 1992 land use data. Even though the land use data is 26 years old, it is unlikely that any of the “urban” type land use has been converted to “rural” type land use in the intervening years; it is more likely that the opposite has occurred. Based on Auer land use analysis with 1992 data, the site is fairly close to either rural or urban.

4.3.2 Population Density Procedure

The population within a 3-kilometer radius of the proposed stack location is approximately 50,360 people (Attachment B). This is approximately 1,781 people per square kilometer. If the population density is greater than 750 people per square kilometer, urban coefficients should be used. Therefore, the site should be modeled with the urban dispersion coefficient. AERMOD utilizes the population of the urban area. The population value for this modeling analyses is 900,000 which was recommended by the NJDEP during the most recent modeling analysis performed for the Refinery.

4.4 TOPOGRAPHY

Receptor elevations were determined with the use of the EPA program AERMAP. National Elevation Dataset (NED) downloaded from http://www.mrlc.gov/viewerjs/ were input into AERMOD to determine the proper elevation of each receptor. The downloaded NED file contains elevations based on 10-meter resolution data. The NED file that was used is included on CD-ROM with this modeling report.

5.0 SOURCES OF EMISSIONS

5.1 PROJECT SOURCES OF EMISSIONS

All new sources of emissions for a given compound are included in the air dispersion modeling for that compound. Table 5-1 lists the estimated maximum short-term (hourly) emissions during steady state operation firing natural gas and ULSD, and annual emissions for the combustion turbine. Emission rates at partial loads and emission rates during periods of startup and shutdown are provided in Tables 5-3 and 5-4, respectively.

TABLE 5-1
Combustion Turbine Emission Rates

Pollutant	Maximum Short-Term (Hourly) Emission Rates[1]		Annual Emission Rates
	Natural Gas	USLD	
	lb/hr	lb/hr	tpy
NO_X	18.30	40.40	87.60
CO	11.10	36.90	80.16
SO_2	3.45	4.80	12.22
TSP	9.30	46.00	54.55
PM_{10}[2]	11.58	49.17	62.61
$PM_{2.5}$[2]	11.58	49.17	62.61
H_2SO_4	2.12	3.10	7.53
NH_3	16.90	18.70	73.47
Acrolein	0.0161	--	0.0706
Arsenic	--	0.0286	0.0114
Benzene	0.0082	0.1430	0.0899
Butadiene (1,3-)	0.0011	0.0416	0.021
Cadmium	--	0.0125	0.0050
Formaldehyde	0.443	0.728	2.05
Lead	--	0.024	0.0096

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Pollutant	Maximum Short-Term (Hourly) Emission Rates[1]		Annual Emission Rates
	Natural Gas	USLD	
	lb/hr	lb/hr	tpy
Mercury	--	0.0031	0.0012
PAH	0.0055	0.104	0.064
Selenium	--	0.065	0.026
Toluene	0.327	--	1.43

1 Steady state operation.
2 Includes ammonia salts based on assumption that 40% of the SO_2 converts to SO_3 and 100% of the SO_3 reacts with ammonia to form $(NH_4)_2SO_4$.

There are no special source types (i.e., covered stacks or horizontal exhausts) associated with this project.

COMBUSTION TURBINE

The proposed combustion turbine will exhaust through a single stack. The physical exhaust parameters of the proposed stack are provided in Table 5-2.

TABLE 5-2
Combustion Turbine Stack Parameters

UTM Coordinates		Zone	Base Elevation	Stack Height	Stack Exit Diameter
Easting	Northing				
(m)	(m)		(ft)	(ft)	(ft)
565,998	4,498,129	18	7	190	22

The combustion turbine may operate at less than 100 percent load. Therefore, it is necessary to perform a load analysis to determine the worst-case modeling scenario. As the load decreases, the stack exit velocity and emission rates will decrease. In addition to the base load condition (100 percent load), impacts at two additional load cases, approximately 75 percent load and 50 percent load, were evaluated. Emissions from the combustion turbine stack were also evaluated with stack parameters (exit temperature and velocity) based on three (3) different ambient temperatures, 10°F (0°F while firing ULSD), 50°F, and 92°F. Tables 5-3 through 5-5 list the stack exhaust parameters and emission rates for the three loads that were evaluated for each fuel at three (3) ambient temperature conditions. Each of the 18 scenarios were modeled.

TABLE 5-3
Stack Exhaust Parameters at Various Loads at High Ambient Temperature (92°F)

Stack Parameter		Steady State Operation					
		NG			ULSD		
		100% Load	75% Load	50% Load	100% Load	75% Load	50% Load
Exit Temperature	(°F)	261	262.9	256	306	297.7	296.3
Exit Velocity	(ft/s)	60.77	47.53	38.57	61.64	47.64	39.61
Pollutant Emission Rates							
NO_X	(lb/hr)	17.33	12.97	9.97	35.7	28.27	21.54
CO	(lb/hr)	10.51	7.87	6.05	32.6	25.8	19.7
SO_2	(lb/hr)	3.27	2.45	1.88	4.20	3.33	2.53
TSP	(lb/hr)	8.81	6.59	5.07	40.66	32.2	24.54
PM_{10}[1]	(lb/hr)	10.97	8.21	6.31	43.43	34.4	26.21
$PM_{2.5}$[1]	(lb/hr)	10.97	8.21	6.31	43.43	34.4	26.21

1 Includes ammonia salts based on assumption that 40% of the SO_2 converts to SO_3 and 100% of the SO_3 reacts with ammonia to form $(NH_4)_2SO_4$.

TABLE 5-4
Stack Exhaust Parameters at Various Loads at Medium Ambient Temperature (50°F)

Stack Parameter		Steady State Operation					
		NG			ULSD		
		100% Load	75% Load	50% Load	100% Load	75% Load	50% Load
Exit Temperature	(°F)	243	249.6	229.8	309	302.1	295.5
Exit Velocity	(ft/s)	61.04	49.54	37.06	67.13	51.66	40.84
Pollutant Emission Rates							
NO_X	(lb/hr)	17.99	13.91	10.30	39.90	30.94	23.50
CO	(lb/hr)	10.91	8.44	6.25	36.40	28.25	21.46
SO_2	(lb/hr)	3.4	2.63	1.95	4.70	3.64	1.80
TSP	(lb/hr)	9.14	7.07	5.24	45.42	35.22	26.75
PM_{10}[1]	(lb/hr)	11.38	8.80	6.52	48.52	37.62	28.58
$PM_{2.5}$[1]	(lb/hr)	11.38	8.80	6.52	48.52	37.62	28.58

1 Includes ammonia salts based on assumption that 40% of the SO_2 converts to SO_3 and 100% of the SO_3 reacts with ammonia to form $(NH_4)_2SO_4$.

TABLE 5-5
Stack Exhaust Parameters at Various Loads
at Low Ambient Temperature (10°F for NG, 0°F for ULSD)

Stack Parameter		Steady State Operation					
		NG			ULSD		
		100% Load	75% Load	50% Load	100% Load	75% Load	50% Load
Exit Temperature	(°F)	239	240.2	218.2	313	307.2	295
Exit Velocity	(ft/s)	61.4	48.98	36.49	67.82	53.16	40.75
Pollutant Emission Rates							
NO_X	(lb/hr)	18.30	14.24	10.64	40.40	31.44	24.18
CO	(lb/hr)	11.10	8.64	6.45	36.9	28.71	22.08
SO_2	(lb/hr)	3.45	2.69	2.01	4.80	3.74	2.87
TSP	(lb/hr)	9.30	7.24	5.41	46.00	35.80	27.53
PM_{10}[1]	(lb/hr)	11.58	9.01	6.73	49.17	38.26	29.42
$PM_{2.5}$[1]	(lb/hr)	11.58	9.01	6.73	49.17	38.26	29.42

1 Includes ammonia salts based on assumption that 40% of the SO_2 converts to SO_3 and 100% of the SO_3 reacts with ammonia to form $(NH_4)_2SO_4$.

Also, periods of start-ups and shut downs (SU/SD) may result in elevated emission rates for NO_X, CO and VOC since the temperature during periods of SU/SD will not be sufficient to optimize emissions controls. SU/SD events were also evaluated. Table 5-6 lists the potential emissions and stack exhaust parameters during the SU/SD events.

Pursuant to the U.S. EPA Memorandum, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard" dated March 1, 2011, "intermittent" sources may be excluded from the 1-hour NO_2 modeling demonstration due to their effective imposition of "an additional level of stringency beyond that intended by the level of the standard itself." In accordance with guidance received from the NJDEP air dispersion modeling staff and the aforementioned U.S. EPA memorandum dated March 1, 2011, intermittent sources will not be included in the air dispersion modeling runs for the 1-hour NO_2 impacts. Intermittent sources of NO_X that will not be included in the air dispersion modeling include cold startups while firing natural gas, and the startups and shutdowns while firing ULSD. These intermittent sources are excluded from the 1-hour NO_2 impacts analysis due to the limited number of annual events and limited duration of the individual events. As shown in Table 5-6 below, cold startups while firing natural gas will be limited to 5 events per year, and cold, warm and hot startups firing ULSD will be limited to 5, 10, and 10 events per year, respectively.

TABLE 5-6
Stack Exhaust Parameters during SU/SD

Parameter		Start-Ups						Shut Downs	
		Cold Start		Warm Start		Hot Start			
		NG	ULSD	NG	ULSD	NG	ULSD	NG	ULSD
Number of events		5	5	200	10	95	10	300	25
Hours per event		3.0	3.0	1.0	1.0	0.5	0.5	0.7	0.7
Hours per year		15	15	200	10	47.5	5	210	17.5
Stack Parameters									
Exhaust Temperature	(°F)	164	221	179	235	209	274	181	243
Exit Velocity	(ft/s)	18.29	20.37	30.70	33.91	46.05	50.86	30.17	33.62
Pollutant Emission Rates									
NO_X	(lb/hr)	82.86	45.4	43.85	37.01	37.65	53.9	22.49	53.22
CO	(lb/hr)	555.8	547.04	142.44	181.56	152.65	244.15	94.83	80.87
SO_2	(lb/hr)	1.02	1.4	1.72	2.34	2.59	3.51	1.73	1.82
TSP	(lb/hr)	2.59	14.03	4.41	23.41	6.61	35.11	17.35	18.23
PM_{10}[1]	(lb/hr)	3.26	14.80	5.54	24.71	8.31	37.06	18.31	19.25
$PM_{2.5}$[1]	(lb/hr)	3.26	14.80	5.54	24.71	8.31	37.06	18.31	19.25

1 Includes ammonia salts based on assumption that 40% of the SO_2 converts to SO_3 and 100% of the SO_3 reacts with ammonia to form $(NH_4)_2SO_4$.

5.2 OFF-PROPERTY SOURCES

As discussed previously, the maximum 1-hour and annual NO_2 impacts, the maximum 1-hour and 8-hour CO impacts, the maximum 1-hour, 3-hour, 24-hour, and annual SO_2 impacts, the maximum 24-hour PM_{10} impact, the maximum 24-hour and annual $PM_{2.5}$ impacts, and the maximum 3-month lead impacts are less than their respective SILs. Therefore, modeling of off-property sources is not required.

5.3 TYPES OF EMISSION SOURCES

As mentioned previously, emissions from the combustion source were modeled as a point source. The actual proposed stack height, stack exit diameter, stack exit temperature, and stack exit velocity were used.

6.0 MODELS PROPOSED AND MODELING TECHNIQUES

Modeling was performed in accordance with the procedures found in the USEPA document, Guideline on Air Quality Models (Appendix W of 40 CFR Part 51, 2017), NJDEP document, Guideline on Air Quality Impact Modeling Analysis, Technical Manual 1002, November 2009, and NJDEP document, Guidance on Risk Assessment for Air Contaminant Emissions, Technical Manual 1003, and guidance provided by NJDEP staff.

The most recent version of the EPA regulatory atmospheric dispersion model, AERMOD (version 16216r), was used to determine the maximum short-term and annual impacts of the maximum emissions from the proposed facility. This model is appropriate for single and multiple sources in urban and rural areas comprised of simple and complex terrain. The horizontal limit of prediction from this model is 50 km, which is beyond the modeling grid to be selected for the initial impacts assessment.

6.1 MODELING TECHNIQUES

Modeling was performed to demonstrate compliance with PSD increments and NAAQS, NJAAQS for criteria pollutants (shown in Section 3) and state risk assessment guidelines. The following sections discuss the techniques and methodologies that were utilized to make the appropriate demonstrations.

6.1.1 Preliminary Impact Determination

The first step in any of the required demonstrations is to model the proposed source(s) to determine the maximum off-property impact associated with the proposed source(s) of a given compound.

The project is a major source for several criteria pollutants, NO_X, TSP, PM_{10}, $PM_{2.5}$, H_2SO_4, and ozone. For NO_X, NO_2 is the compound regulated as a criteria pollutant; however, PSD threshold levels are based on the sum of all oxides of nitrogen (NO_X). The area is designated as nonattainment for ozone. Net emissions increases of both NO_X and VOCs (i.e., precursors of ozone) are less than 100 tpy so an ambient ozone impact analysis is therefore not required Current NJDEP guidance is to use meteorological data from the years 2010, 2011, 2012, 2013, and 2014. Section 9 contains a discussion of the proposed meteorological data.

In order to minimize the number of runs executed, the stack was modeled with an emission rate of 1 pound per hour (0.126 grams per second) so that the calculated emissions (in units of pounds per hour (lb/hr)) can be multiplied by the unit emission rate impacts (in units of ($\mu g/m^3$)/(lb/hr)) to obtain maximum predicted impacts. A set of five (5) air dispersion model runs were performed for the combustion turbine, one run for each of five years of meteorological data. Each modeling run included stack parameters representing various operating scenarios: (1) operation at base load, operation at 75 percent load, and operation at approximately 50 percent load, (2) operating at three different ambient temperatures, and (3) use of two fuels, natural gas and ULSD. The stack was modeled with a combination of the worst-case stack temperature (i.e., the lowest stack temperature which occurs when burning natural gas at a 50% load and low ambient temperatures) and the worst-case velocity (i.e., the smallest exit velocity which also occurs when burning natural gas at a 50% load and low ambient temperatures). These runs are used to determine maximum predicted 1-hour and annual impacts of NO_2, 1-hour and 8-hour impacts of CO, 1-hour, 3-hour, 24-hour, and annual impacts of SO_2, 24-hour and annual impacts of $PM_{2.5}$, 24-hour impact of PM_{10}, and the appropriate averaging period for each non-criteria pollutant. The maximum emission rate, regardless of the scenario was multiplied by the maximum impact regardless of the scenario to determine the maximum predicted impact.

Using this methodology only $PM_{2.5}$ exceeded its appropriate SILs. One (1) dispersion model run was executed with the 5-year concatenated meteorological data set using actual $PM_{2.5}$ emission rates. This run is used to determine the 5-year average of the 24-hour and/or annual high impact at each receptor. This run includes each of the eighteen (18) scenarios with their appropriate stack parameters and emission rates as listed in Tables 5-3 through 5-5. The 5-year average of the high-1-high (H1H) is used for the SIL comparison. With this approach, as shown in Section 11.2.4, the maximum $PM_{2.5}$ impacts are less than its respective SILs.

Lastly, impacts associated with startups and shutdowns were evaluated. Table 5-6 lists eight (8) startup/shutdown scenarios. A single dispersion run with each scenario represented was executed with an emission rate of 1 pound per hour for each scenario. Only 1-hour and 3-hour averaging periods was included in the modeling since none of the startup/shutdown scenarios exceed three (3) hours. The resultant impacts were multiplied by the appropriate emission rate and compared to their respective SIL. Initially the 3-hour impacts were used to conservatively compare against the 8-hour and 24-hour SILs. As shown in Section 11 all criteria pollutants except $PM_{2.5}$ have impacts less than their respective SILs.

Because the 24-hour $PM_{2.5}$ SIL is exceeded by the 3-hour $PM_{2.5}$ impact for each start-up/shutdown scenario, each scenario was modeled with the 5-year concatenated meteorological data set to determine the 5-year average H1H 24-hour impact to compare to the SIL. Stack parameters and emissions rates were based on the following example equations.

$$Temp = (n \times Temp_{Scenario} + (24 - n) \times Temp_{normal}) \div 24$$

$$Velocity = (n \times Velocity_{Scenario} + (24 - n) \times Velocity_{normal}) \div 24$$

$$Emis\ Rate = (n \times Emis\ Rate_{Scenario} + (24 - n) \times Emis\ Rate_{normal}) \div 24$$

Where:	n	= number of hours per event
	$Temp_{Scenario}$	= the temperature of the SU/SD event;
	$Temp_{Normal}$	= the normal worst-case operating temperature;
	$Velocity_{Scenario}$	= the exit velocity of the SU/SD event;
	$Velocity_{Normal}$	= the normal worst-case operating exit velocity;
	$Emis\ Rate_{Scenario}$	= the emission rate (lb/hr) of the SU/SD event; and
	$Emis\ Rate_{Normal}$	= the normal worst-case emission rate (lb/hr).

The worst-case “normal” scenario occurs while the turbine is firing ULSD at base load (100% load) during medium ambient temperatures (i.e., at 50°F). The $PM_{2.5}$ emission rate during this scenario is 48.52 lb/hr and the stack exit temperature and velocity are 309˚F and 67.13 ft/s, respectively (see Table 5-4). Stack parameters for the eight (8) start-up/shutdown scenarios are presented in Table 6-1.

TABLE 6-1
Stack Exhaust Parameters during SU/SD For 24-Hour $PM_{2.5}$ Model Run

Parameter		Start-Ups						Shut Downs	
		Cold Start		Warm Start		Hot Start			
		NG	ULSD	NG	ULSD	NG	ULSD	NG	ULSD
Hours per event		3.0	3.0	1.0	1.0	0.5	0.5	0.7	0.7
Stack Parameters									
Exhaust Temperature	(°F)	290.88	298.00	303.58	305.92	306.92	308.27	305.27	307.08
	(°K)	416.97	420.93	424.03	425.33	425.88	426.63	424.96	425.97
Exit Velocity	(ft/s)	61.03	61.29	65.61	65.75	66.69	66.79	66.05	66.15
	(m/s)	18.600	18.680	19.999	20.039	20.327	20.358	20.133	20.163
Pollutant Emission Rates									
$PM_{2.5}$[1]	(lb/hr)	43.60	44.73	46.87	47.65	47.74	48.37	47.69	47.78
	(g/s)	5.494	5.635	5.905	6.004	6.016	6.095	6.009	6.021

[1] Includes secondary $PM_{2.5}$ emissions (see Section 10.9.2)

For example, using the data provided in Tables 5-4 and 5-6, the cold start while firing natural gas scenario was calculated as follows:

$$Temp = (3 \times 164 \quad {}^{O}F + (24-3) \times 309 \quad {}^{O}F) \div 24 = 290.88 \quad {}^{O}F$$

$$Velocity = \left(3 \times 18.29\frac{m}{s} + (24-3) \times 67.13 ft/s\right) \div 24 = 61.03\ ft/s$$

$$Emis\ Rate = \left(3 \times 9.174\frac{lb}{hr} + (24-3) \times 48.52\ lb/hr\right) \div 24 = 43.60\ lb/hr$$

As discussed previously, based on actual $PM_{2.5}$ emission rates, neither the 24-hour maximum nor annual maximum $PM_{2.5}$ impact exceeded their respective SIL. However, a $PM_{2.5}$ increment analysis was conducted. $PM_{2.5}$ increment consuming may include: (1) a comparison of the predicted impacts of the combustion turbine and the allowable increment values, and (2) an evaluation on the extent to which, if any, increment has already been consumed in the area by PSD increment consuming sources that have been permitted prior to the Project. Item (2) will be determined by comparing the most recent year of $PM_{2.5}$ monitoring data with the first full year of $PM_{2.5}$ monitoring data that occurred before the $PM_{2.5}$ baseline date for the area.

Before the 24-hour and annual $PM_{2.5}$ SILs were used in the preliminary determination, a demonstration was made justifying the use of the SILs. This demonstration is discussed in Section 10.8.

As shown in Section 11 the maximum predicted impact for each criteria pollutant is less than the respective SIL for each averaging period.

6.1.2 Full PSD NAAQS Analysis

The maximum predicted concentration for each compound/averaging period does not exceed its respective SIL; therefore, a full PSD NAAQS analysis is not required for any compound.

6.1.3 Risk Assessment Analysis

In order to minimize the number of air dispersion modeling runs executed, the stack was modeled with an emission rate of 1 pound per hour so that the estimated emissions (in units of pounds per hour (lb/hr)) can be multiplied by the unit emission rate impacts (in units of ($\mu g/m^3$)/(lb/hr)) to obtain maximum predicted impacts. One (1) air dispersion model run was performed for the combustion turbine. The meteorology data set utilized in the modeling run consisted of 5 years of concatenated data. Maximum 1-hour, 8-hour, and 24-hour impacts was determined over this 5-year period. In addition, the 5-year average concentration at each receptor was determined. The maximum modeled concentration for the 5-year period was used to calculate the long-term carcinogenic and non-carcinogenic risks.

6.2 MODEL OPTIONS

The following key model options were utilized when running the AERMOD model:

1. Stack tip downwash;
2. Model account for elevated terrain effects;
3. Use calm procession routine;
4. Use missing data processing routine; and
5. No exponential decay.

7.0 BACKGROUND AIR QUALITY CONCENTRATIONS

Monitoring data from existing monitors within Union County are used in lieu of collecting pre-construction monitoring data to justify the use of the 24-hour and annual $PM_{2.5}$ significant impact levels (SILs). On January 22, 2013, the D.C. Circuit Court decision vacated the Significant Monitoring Concentration (SMC) for $PM_{2.5}$ and on December 9, 2013, the EPA published a final rule (78 FR73698) to revise the $PM_{2.5}$ SMC to 0 $\mu g/m^3$. Therefore, preconstruction monitoring for $PM_{2.5}$ is required. However, existing monitors may be used in lieu of installing a new monitor. A request to waive the site-specific monitoring requirements was submitted to NJDEP on March 14, 2018. Approval to waive the site-specific monitoring requirements was issued by NJDEP on March 28, 2018. Both documents are provided as Attachment C.

An evaluation of the existing $PM_{2.5}$ monitors in the vicinity of the Project to determine the representative monitor for justification of the remanded SILs and for development of the preconstruction $PM_{2.5}$ monitoring data is provided in Section 7.1 below. The same monitor that is used to justify the remanded SILs is used to develop the preconstruction $PM_{2.5}$ monitoring data.

For the NAAQS analyses, the maximum predicted impact for each criteria pollutant is less than its respective SIL for each applicable averaging period. However, the appropriate background concentration is added to the modeled impact to demonstrate compliance with the NAAQS and NJAAQS.

Only existing monitoring data that meets the completeness requirement is used. A year meets data completeness criteria when at least 75 percent of the scheduled sampling days for each quarter have valid data. A day is considered complete when 75 percent of the scheduled sampling hours for the day have valid data.

7.1 EXISTING $PM_{2.5}$ MONITORING DATA

There are three (3) $PM_{2.5}$ monitors located within Union County. Table 7-1 lists each monitor, provides its EPA Identification Number, and provides the distance and direction from the Project. The direction given is degrees from north (north is 0 degrees) in a clockwise direction from the Project.

TABLE 7-1
UNION COUNTY $PM_{2.5}$ MONITORS

Site Name/Address	ID (AQS Code)	Distance (m)	Direction (Deg)
Elizabeth Lab Interchange 13, New Jersey Turnpike, Elizabeth	34-039-0004	1,464	40
Mitchell Building, 500 North Broad Street, Elizabeth	34-039-0006	4,702	6
Fire Department Building 1300 Main Street, Rahway	34-039-2003	5,562	239

7.1.1 Selecting a Representative $PM_{2.5}$ Monitor

In order to determine which monitor in the vicinity most closely represents the locality of the Project, several characteristics are generally compared. These characteristics include quantity of emissions due to nearby $PM_{2.5}$ sources, nearby population, nearby land use, and nearby topographic features.

Since Monitor ID 34-039-0004 (Elizabeth Lab) is only 1,464 meters (i.e., less than 1 mile) from the proposed combustion turbine stack, the nearby level of $PM_{2.5}$ emissions, the nearby population, nearby land use, and nearby topographic features are expected to be most representative of those characteristics near the Project. Therefore, the data collected at the Elizabeth Lab monitor was used to determine the background concentration of $PM_{2.5}$ near the Project.

7.1.2 Recent $PM_{2.5}$ Ambient Concentrations Measured at Monitor ID 34-039-0004

The three (3) most recent years of $PM_{2.5}$ concentrations measured at the Elizabeth Lab monitor were analyzed to determine a representative background concentration for the Project. The $PM_{2.5}$ concentrations were collected in 2014, 2015, and 2016. Table 7-2 lists the monitoring data collected at the Elizabeth Lab monitor.

TABLE 7-2
$PM_{2.5}$ MONITORING DATA COLLECTED AT MONITOR ID 34-039-0004
(Elizabeth Lab)

Year	Quarter	Percent Valid	Quarterly Average (µg/m³)	Annual Average (µg/m³)	24-Hour 98th Percentile (µg/m³)
2014	1	94.4	13.4	10.2	25.7
	2	100	9.6		
	3	100	9.6		
	4	100	8.3		
2015	1	95.6	11.3	10.2	26.8
	2	95.6	9.5		
	3	96.7	10.7		
	4	91.3	9.4		
2016	1	90.1	9.4	9.1	19.6
	2	90.1	8.7		
	3	93.5	9.1		
	4	97.8	9.2		
3-Year Average				9.9	24

Based on the monitoring results at the Elizabeth Lab monitor, the 24-hour and annual background concentrations for the Project site are 24 µg/m³ and 9.9 µg/m³ respectively.

7.2 EXISTING NO_2 MONITORING DATA

There is one (1) NO_2 monitor located within Union County. The same Monitor ID (34-039-0004) was selected to provide the background NO_2 data as was used for the $PM_{2.5}$ data. Table 7-3 lists the monitor, provides its EPA Identification Number, and provides the distance and direction from the proposed Linden 7 facility.

TABLE 7-3
UNION COUNTY NO_2 MONITORS

Site Name	ID (AQS Code)	Distance (m)	Direction (Deg)
Elizabeth Lab, Interchange 13, New Jersey Turnpike	34-039-0004	1,464	40

7.2.1 Selecting a Representative NO_2 Monitor

In order to determine which monitor is situated in a locality that most closely represents the locality of the proposed Linden 7 facility, several characteristics are generally compared. These characteristics include quantity of emissions due to nearby NO_2 sources, nearby population, nearby land use, and nearby topographic features.

Since Monitor ID 34-039-0004 (Elizabeth Lab) is only 1,464 meters from the proposed Linden 7 stack, the nearby level of NO_2 emissions, the nearby population, nearby land use, and nearby topographic features are expected to be most representative of those characteristics near the Project. Therefore, the data collected at the Elizabeth Lab monitor was used to determine the background concentration of NO_2 near the Linden 7 facility.

7.2.2 Recent NO_2 Ambient Concentrations Measured at Monitor ID 34-039-0004

The three (3) most recent years of NO_2 concentrations measured at the Elizabeth Lab monitor were analyzed to determine a representative background concentration for the proposed Linden 7 site. The NO_2 concentrations were collected in 2014, 2015, and 2016. Table 7-4 lists the monitoring data collected at the Elizabeth Lab monitor.

TABLE 7-4
NO_2 MONITORING DATA COLLECTED AT MONITOR ID 34-039-0004
(Elizabeth Lab)

Year	Quarter	Percent Valid	Annual Average (ppb)	1-Hour 98th Percentile (ppb)
2014	1	94.4	21.9	70
	2	96.7		
	3	100		
	4	100		
2015	1	100	22.2	66
	2	100		
	3	100		
	4	100		
2016	1	100	20.3	59
	2	98.9		
	3	100		
	4	96.7		
3-Year Maximum			22	65

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Based on the monitoring results at the Elizabeth Lab monitor, the 1-hour and annual background concentrations for the proposed Linden 7 site are 65 ppb (122.6 μg/m^3) and 22 ppb (41.5 μg/m^3) respectively.

7.3 EXISTING CO MONITORING DATA

There are two (2) CO monitors located within Union County. Table 7-5 lists each monitor, provides its EPA Identification Number, and provides the distance and direction from the proposed Linden 7 facility.

TABLE 7-5
UNION COUNTY CO MONITORS

Site Name	ID (AQS Code)	Distance (m)	Direction (Deg)
Elizabeth Lab, Interchange 13, New Jersey Turnpike	34-039-0004	1,464	40
7 Broad Street	34-039-0003	2,813	352

7.3.1 Selecting a Representative CO Monitor

In order to determine which monitor is situated in a locality that most closely represents the locality of the proposed Linden 7 facility, several characteristics are generally compared. These characteristics include quantity of emissions due to nearby CO sources, nearby population, nearby land use, and nearby topographic features.

Since Monitor ID 34-039-0004 (Elizabeth Lab) is only 1,464 meters from the proposed Linden 7 stack, the nearby level of CO emissions, the nearby population, nearby land use, and nearby topographic features are expected to be most representative of those characteristics near the Project. Therefore, the data collected at the Elizabeth Lab monitor was used to determine the background concentration of CO near the Linden 7 facility.

7.3.2 Recent CO Ambient Concentrations Measured at Monitor ID 34-039-0004

The three (3) most recent years of CO concentrations measured at the Elizabeth Lab monitor were analyzed to determine a representative background concentration for the proposed Linden 7 site. The CO concentrations were collected in 2014, 2015, and 2016. Table 7-6 lists the monitoring data collected at the Elizabeth Lab monitor.

TABLE 7-6
CO MONITORING DATA COLLECTED AT MONITOR ID 34-039-0004
(Elizabeth Lab)

Year	Quarter	Percent Valid	1-Hour (ppm)	8-Hour (ppm)
2014	1	94.4	2.2	1.8
	2	96.7		
	3	100		
	4	100		
2015	1	100	2.4	1.55
	2	100		
	3	100		
	4	100		
2016	1	100	2.8	1.9
	2	100		
	3	100		
	4	96.7		
3-Year Maximum			2.8	1.8

Based on the monitoring results at the Elizabeth Lab monitor, the 1-hour and 8-hour background concentrations for the proposed Linden 7 site are 2.8 ppm (3,220 µg/m^3) and 1.8 ppm (2,070 µg/m^3), respectively.

7.4 EXISTING SO_2 MONITORING DATA

There are two (2) SO_2 monitors located within Union County. The same monitor (34-039-0004) was selected to provide the background SO_2 data as was used for the $PM_{2.5}$ data. Table 7-7 lists the monitor, provides its EPA Identification Number, and provides the distance and direction from the proposed Linden 7 facility.

TABLE 7-7
UNION COUNTY SO_2 MONITORS

Site Name	ID (AQS Code)	Distance (m)	Direction (Deg)
Elizabeth Lab, Interchange 13, New Jersey Turnpike	34-039-0004	1,464	40
7 Broad Street	34-039-0003	2,813	352

7.4.1 Selecting a Representative SO_2 Monitor

In order to determine which monitor is situated in a locality that most closely represents the locality of the proposed Linden 7 facility, several characteristics are generally compared. These characteristics include quantity of emissions due to nearby SO_2 sources, nearby population, nearby land use, and nearby topographic features.

Since Monitor ID 34-039-0004 (Elizabeth Lab) is only 1,464 meters from the proposed Linden 7 stack, the nearby level of SO_2 emissions, the nearby population, nearby land use, and nearby topographic features are expected to be most representative of those characteristics near the Project. Therefore, the data collected at the Elizabeth Lab monitor was used to determine the background concentration of SO_2 near the Linden 7 facility.

7.4.2 Recent SO2 Ambient Concentrations Measured at Monitor ID 34-039-0004

The three (3) most recent years of SO_2 concentrations measured at the Elizabeth Lab monitor were analyzed to determine a representative background concentration for the proposed Linden 7 site. The SO_2 concentrations were collected in 2014, 2015, and 2016. Table 7-8 lists the monitoring data collected at the Elizabeth Lab monitor.

TABLE 7-8
SO_2 MONITORING DATA COLLECTED AT MONITOR ID 34-039-0004
(Elizabeth Lab)

Year	Quarter	Percent Valid Days	Annual Average (ppb)	1-Hour 99th Percentile (ppb)	3-Hour H2H (ppb)	24-Hour H2H (ppb)
2014	1	93.3	0.6	13	11	5
	2	96.7				
	3	100				
	4	100				
2015	1	100	0.4	15	21	5
	2	100				
	3	100				
	4	100				
2016	1	100	0.2	7	9	2.8
	2	100				
	3	100				
	4	96.7				
3-Year Maximum			0.6	12[1]	21	5

1 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hr SO_2 concentrations.

Based on the monitoring results at the Elizabeth Lab monitor, the 1-hour, 3-hour, 24-hour and annual background concentrations for the proposed Linden 7 site are 12 ppb (31.4 µg/m^3), 21 (55.0 µg/m^3) ppb, 5 ppb (13.1 µg/m^3), and 0.6 ppb (1.6 µg/m^3) respectively.

7.5 EXISTING PM_{10} MONITORING DATA

There are two (2) PM_{10} monitors located within New Jersey. Table 7-9 lists the monitors, provides their EPA Identification Numbers, and provides the distance and direction from the proposed Linden 7 facility.

TABLE 7-9
NEW JERSEY PM_{10} MONITORS

Site Name	ID (AQS Code)	Distance (m)	Direction (Deg)
Consolidated Firehouse, 355 Newark Ave., Jersey City	34-017-1003	~17,500	53
Morgan Blvd and I-676 Entrance Ramp, Camden	34-007-0009	~110,000	224

7.5.1 Selecting a Representative PM_{10} Monitor

In order to determine which monitor is situated in a locality that most closely represents the locality of the proposed Linden 7 facility, several characteristics are generally compared. These characteristics include quantity of emissions due to nearby PM_{10} sources, nearby population, nearby land use, and nearby topographic features.

Since Monitor ID 34-017-1003 (Consolidated Firehouse) is the closer of the two monitors and is recommended by the NJDEP, data collected at the Consolidated Firehouse monitor was used to determine the background concentration of PM_{10} near the Linden 7 facility.

7.5.2 Recent PM_{10} Ambient Concentrations Measured at Monitor ID 34-017-1003

The three (3) most recent years of PM_{10} concentrations measured at the Consolidated Firehouse monitor were analyzed to determine a representative background concentration for the proposed Linden 7 site. The PM_{10} concentrations were collected in 2014, 2015, and 2016. Table 7-10 lists the monitoring data collected at the Elizabeth Lab monitor.

TABLE 7-10
PM_{10} MONITORING DATA COLLECTED AT MONITOR ID 34-017-1003
(Consolidated Firehouse)

Year	Quarter	Percent Valid Days	Annual Average (ppb)	24-Hour H2H (ppb)
2014	1	80.0	17	38
	2	86.7		
	3	100		
	4	100		
2015	1	100	19	43
	2	100		
	3	100		
	4	100		
2016	1	87.5	16	32
	2	93.3		
	3	100		
	4	93.3		
3-Year Maximum			19	43

Based on the monitoring results at the Consolidated Firehouse monitor, 24-hour and annual PM_{10} background concentrations for the proposed Linden 7 site are 43 μg/m^3 and 19 μg/m^3 respectively.

8.0 RECEPTOR NETWORK

The receptor grid used in the analysis consists of 50-meter spaced receptors starting at the fence line and extending out to 500 meters from the fence line. It also includes 100-meter spaced receptors extending out to 1,500 meters from the fence line, 250-meter spaced receptors extending out to 3,000 meters from the fence line, and lastly, 500-meter spaced receptors extending out to approximately 10,000 meters from the fence line. Note that ambient air is the air beyond the fence line of the Linden 7 facility. The UTM horizontally referenced data is North American Datum (NAD) 83. The various receptor grids are shown in Attachment D.

9.0 METEOROLOGICAL DATA

Dispersion model runs were executed using five (5) years of meteorological data. The surface data utilized in the modeling runs are from the Newark Liberty International Airport in Newark, New Jersey (WBAN 14734) and the upper air data were from the New York weather forecast office (WFO) located in Brookhaven, New York (WBAN 94703). The data was collected during the years of 2010 through and including 2014. These are the data sets provided by the NJDEP for modeling facilities located within Union County. The meteorological data was concatenated for the probabilistic NAAQS (i.e., the 1 hour NO_2, 1 hour SO_2, and the 24 hour and annual $PM_{2.5}$). The surface elevation at the site of the Newark International Airport surface observations is approximately 10 feet (3 meters). The meteorological data used in the dispersion models includes wind speed, wind direction, temperature and various other parameters.

10.0 SPECIAL MODELING CONSIDERATIONS

10.1 COOLING TOWERS

There will not be cooling towers are associated with the Project. The project will utilize existing the air cooled condenser associated with Linden 5. A cooling water module (Fin-Fan) will be constructed at the facility; however, the cooling water will be contained in piping and there will be no emissions to the atmosphere.

10.2 COASTAL FUMIGATION

The Project will be located in an area designated as urban. Therefore, coastal fumigation is not considered an issue for the facility.

10.3 HEALTH RISK ASSESSMENT

The Project is expected to emit several non-criteria compounds, including some hazardous air pollutants (HAPs), in the operation of the combustion turbine. HAPs that are expected to be emitted in quantities greater than their respective reporting quantities are listed in Table 10-1. In addition, the table includes their calculated maximum emission rates.

TABLE 10-1
MAXIMUM HAZARDOUS COMPOUND EMISSION RATES

Chemical	CAS No.	Emission Rate (lb/hr)	Emission Rate (tpy)	Reporting Threshold (tpy)
Acrolein	107-02-8	0.0161	0.0706	0.004
Ammonia	7664-41-7	18.70	77.24	
Arsenic (inorganic)	---	0.0286	0.0114	0.0005
Benzene	71-43-2	0.1430	0.0899	0.01[1]
Benzo(a)pyrene (used as surrogate for PAH)	50-32-8	0.104	0.0637	0.0010
1,3-Butadiene	106-99-0	0.0416	0.0210	0.0070
Cadmium	---	0.0125	0.0050	0.0010
Formaldehyde	50-00-0	0.728	2.0545	0.2000
Lead	---	0.0240	0.0096	0.0010
Mercury	---	0.00312	0.0012	0.0010
Selenium	---	0.0650	0.0260	0.0100

Chemical	CAS No.	Emission Rate		Reporting Threshold
		(lb/hr)	(tpy)	(tpy)
Sulfuric Acid	7664-93-9	3.10	7.53	
Toluene	108-88-3	0.327	1.4333	1.0000

[1] Benzene is Toxic Substance (TXS) with a reporting threshold of 0.01 lb per hour

Thirteen (13) HAPs were emissions greater than their respective reporting threshold. The NJDEP Division of Air Quality Toxicity Values for Inhalation Exposure is used to determine the cumulative long-term carcinogenic and non-carcinogenic effects and short-term effects of the twelve compounds. The results are discussed in Section 11.4.2

10.4 PROXIMITY TO MAJOR SOURCES

In special cases, NJDEP may require a modeling analysis of emissions from the Project along with emissions from an existing nearby major source. If requested, Linden Cogen will coordinate with NJDEP to identify the location and quantity of nearby major sources to be modeled.

10.5 USE OF RUNNING AVERAGES AND BLOCK AVERAGES

The federal NAAQS are based on block averaging times, i.e., the time when the block average begins and ends is specifically defined and does not vary. The New Jersey NAAQS are based on running averages, i.e., there is no set time when the period must begin and end. Per NJDEP guidance, all impacts were calculated in terms of block averages. These values were used to compare to SILs. Since no SIL is exceeded, additional analyses with comparisons to running averages were not necessary.

10.6 NITROGEN OXIDE TO NITROGEN DIOXIDE CONVERSION

As discussed in Section 11.2.1, the conservative methodology to determine maximum NO_2 impacts (100% conversion of NO_X to NO_2) results in NO_2 impacts that are less than the NO_2 SILs. One exception to this is in regards to warm start impacts. The maximum predicted impact for warm starts assumes a NO_X to NO_2 conversion rate of 90%. This is based on the maximum ARM2 conversion rate of 90%.

10.7 TREATMENT OF HORIZONTAL STACKS AND RAIN CAPS

There will not be any horizontal stacks or stacks equipped with rain caps at the facility.

10.8 JUSTIFICATION FOR THE USE OF THE $PM_{2.5}$ SIL AND SMC

The U.S. Court of Appeals vacated and remanded the SILs and the Significant Monitoring Concentration (SMC) for $PM_{2.5}$ in January 2013.

The use of the SILs for the Project is justified following the guidance provided by EPA in a Memorandum, *"Guidance for $PM_{2.5}$ Permit Modeling,"* dated May 20, 2014. If "the difference between the $PM_{2.5}$ NAAQS and the measured $PM_{2.5}$ background concentrations in the area is greater than or equal to the SIL value selected from the vacated Sections 51.166(k)(2) and 52.21(k)(2), then the EPA believes it would be sufficient in most cases for permitting authorities to conclude that a source with an impact equal to or below that SIL value will not cause or contribute to a violation of the NAAQS and to forego a cumulative modeling analysis for $PM_{2.5}$ with respect to the NAAQS."

When the most recent 3-year average of the 98th percentile 24-hour monitor value (24 μg/m^3) is subtracted from the 24-hour NAAQS (35 μg/m^3), the remainder is greater than the remanded 24-hour SIL (1.2 μg/m^3). When the most recent 3-year average of the annual monitored concentrations (9.9 μg/m^3) is subtracted from the annual NAAQS (12 μg/m^3), the remainder is greater than the remanded annual SIL (0.3 μg/m^3) (or the proposed annual $PM_{2.5}$ SIL, 0.2 μg/m^3). These are shown in Tables 10-2 and 10-3. If the difference between the NAAQS and the measured background concentrations is greater than the applicable SIL, then it can be concluded that a source with an impact less than the SIL would not cause or contribute to a violation of the NAAQS and a cumulative modeling analysis need not be performed.

TABLE 10-2
24-HR $PM_{2.5}$ SIL JUSTIFICATION

EPA Site ID	Pollutant	24-hr Background 3-Year Average (98th percentile) Concentration (μg/m^3)	24-hr NAAQS (μg/m^3)	24-hr NAAQS – Background (μg/m^3)	24-hr SIL (μg/m^3)
34-039-0004 (Elizabeth Lab)	$PM_{2.5}$	24	35	11	1.2

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TABLE 10-3
ANNUAL $PM_{2.5}$ SIL JUSTIFICATION

EPA Site ID	Pollutant	Annual Background 3-Year Average Concentration (ug/m3)	Annual NAAQS (ug/m3)	Annual NAAQS – Background (ug/m3)	Annual SIL (ug/m3)
34-039-0004 (Elizabeth Lab)	$PM_{2.5}$	9.9	12	2.1	0.3 (0.2)[1]

[1] The proposed annual $PM_{2.5}$ SIL is 0.2 µg/m^3.

As discussed above, guidance is given for justifying the $PM_{2.5}$ SILs. However, no guidance is given to justify the $PM_{2.5}$ SMC. Therefore, the pre-application air quality monitoring requirement is met by justifying the use of existing $PM_{2.5}$ monitoring data. The $PM_{2.5}$ monitor identified to justify the $PM_{2.5}$ SILs was also be used to represent background $PM_{2.5}$ concentrations in the Linden 7 area. A request to waive the site-specific monitoring requirements was submitted to NJDEP on March 14, 2018. Approval to waive the site-specific monitoring requirements was issued by NJDEP on March 28, 2018. Both documents are provided as Attachment C.

10.9 SECONDARY FORMATION OF $PM_{2.5}$

$PM_{2.5}$ in the atmosphere may be considered to be "primary" particulate matter that consists of $PM_{2.5}$ directly emitted by sources into the atmosphere and "secondary" particulate matter that is formed in the atmosphere from chemical processes involving a set of precursor gases. This latter fraction is mainly generated through a series of chemical reactions and physical processes involving nitrogen oxides (NO_X), sulfur dioxide (SO_2), ammonia (NH_3) and a large number of volatile organic compounds (VOCs), which may react with ozone (O_3) and other reactive molecules. Sulfate, nitrate, and ammonium are the main components in secondary $PM_{2.5}$ mainly occurring as ammonium sulfate and ammonium nitrate.

The secondary formation of $PM_{2.5}$ results from complex chemical reaction in the atmosphere. The formation of secondary $PM_{2.5}$ is well documented and has presented significant challenges with the identification and establishment of particular models for assessing the impacts of individual stationary sources on the formation of this air pollutant. The EPA AERMOD program can be used to simulate dispersion of direct $PM_{2.5}$ emissions but does not explicitly account for secondary formation of $PM_{2.5}$. EPA's Guidance for $PM_{2.5}$ Permit Modeling lists four assessment cases for addressing direct and secondary formation of $PM_{2.5}$ based on significant emission rates (SERs). The SER for $PM_{2.5}$ is 10 tons per year and the SER for NO_X and/or SO_2 are 40 tons per year each. EPA's "Case 3" is the applicable case for the Project based on the proposed project annual

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emissions, 62.61 tons per year of $PM_{2.5}$ and 87.60 tons per year of NO_X. SO_2 emissions are 12.22 tons per year (i.e., less than the SER) and are not considered further. For Case 3, if direct $PM_{2.5}$ emissions are greater than or equal to 10 tons per year, then primary $PM_{2.5}$ impacts are determined by modeling direct $PM_{2.5}$ emissions following guidance for a NAAQS analysis using AERMOD. In addition, if SO_2 and/or NO_X emissions are greater than or equal to 40 tons per year, then provide a qualitative, hybrid qualitative/quantitative, or quantitative assessment of the secondary formation of $PM_{2.5}$. A quantitative approach is presented in Section 10.9.2.

Secondary emissions of $PM_{2.5}$ are added to primary emissions of $PM_{2.5}$ and are modeled with the EPA AERMOD program and the worst-case $PM_{2.5}$ impacts are determined.

10.9.1 Primary $PM_{2.5}$

Maximum primary emissions of $PM_{2.5}$ are listed in Table 5-1 and primary emissions of $PM_{2.5}$ during various potential operating scenarios are listed in Tables 5-3 through 5-5. The primary emissions of $PM_{2.5}$ listed in Tables 5-1 and 5-3 through 5-5 include $PM_{2.5}$ emissions created by the reaction of SO_3 and ammonia (NH_3). It is assumed that 40% of the SO_2 emissions are converted to SO_3. It is further assumed that 100% of the SO_3 reacts with ammonia to form ammonia salt in the form of $(NH_4)_2SO_4$. The difference between the listed emissions of TSP and $PM_{2.5}$/PM_{10} is the quantity of additional $PM_{2.5}$ created by the reaction of SO_3 with ammonia.

10.9.2 Assessment of Secondary $PM_{2.5}$

Secondary formation of $PM_{2.5}$ is addressed using the approach outlined by the Northeast States for Coordinated Air Use Management (NESCAUM) (Attachment E) in letter dated May 30, 2013 to George Bridges (Air Quality Modeling Group, U.S. EPA) commenting on the "Draft Guidance for $PM_{2.5}$ Permit Modeling" released by EPA on March 4, 2013. NESCAUM reviewed available literature to determine typical worst-case conversion rates of SO_2 to sulfate and NO_2 to nitrate. Secondary $PM_{2.5}$ emissions that may be formed due to SO_2 and NO_2 emissions are added to the modeled primary $PM_{2.5}$ emissions in the modeling input files.

NESCAUM recommends that factors of 7% per hour and 3% per hour be used to convert SO_2 to sulfate on a 24-hour basis and annual basis, respectively. Conversion of NO_2 to nitrate is accomplished with factors of 5% per hour and 2.5% per hour for the 24-hour and annual basis, respectively. In addition, NESCAUM uses a factor of 80% to convert the emitted NO_X to NO_2. Lastly, the secondary emission rate must be adjusted to reflect the heavier sulfate and nitrate compounds. A factor of 2.06 is used to convert SO_2 to $(NH_4)_2SO_4$ and a factor of 1.74 is used to convert NO_2 to NH_4NO_3.

As an example, the secondary $PM_{2.5}$ emissions that is added to the primary $PM_{2.5}$ emissions for the natural gas fired, low ambient temperature, 100 % load scenario are calculated as follows:

24-hour bases -

$$Secondary\ PM_{2.5}\ from\ SO_2 = 3.45\ \frac{lb\ SO_2}{hr} \times 0.07 \times 2.06 = 0.50\ \frac{lb\ PM_{2.5}}{hr}$$

$$Secondary\ PM_{2.5}\ from\ NO_2 = 18.3\ \frac{lb\ NO_2}{hr} \times 0.05 \times 0.80\ \times 1.74 = 1.27\ \frac{lb\ PM_{2.5}}{hr}$$

Therefore, 1.77 lb/hr of secondary $PM_{2.5}$ is added to the primary $PM_{2.5}$ emission rate for the natural gas fired, low ambient temperature, 100 % load scenario 24-hour averaging period modeling for $PM_{2.5}$. Table 10-4 lists the secondary $PM_{2.5}$ emission rate that is added to the primary $PM_{2.5}$ emission rate for each modeled scenario based on the NESCAUM methodology.

TABLE 10-4
CALCULATED SECONDARY $PM_{2.5}$ EMISSIONS
FOR STEADY-STATE OPERATIONS

Ambient Temperature	Load Level	Fuel Used	
		Natural Gas (lb/hr)	ULSD (lb/hr)
High	100%	1.68	3.09
	75%	1.26	2.45
	50%	0.965	1.86
Medium	100%	1.74	3.45
	75%	1.35	2.68
	50%	1.00	1.90
Low	100%	1.77	3.50
	75%	1.38	2.73
	50%	1.03	2.1

For the annual modeling of $PM_{2.5}$, 4.57 tons of secondary $PM_{2.5}$ is added to the primary $PM_{2.5}$. The annual secondary $PM_{2.5}$ emissions were calculated as follows:

Annual bases –

$$Secondary\ PM_{2.5}\ from\ SO_2 = 12.22\ \frac{ton\ SO_2}{yr} \times 0.03 \times 2.06 = 0.755\ \frac{ton\ PM_{2.5}}{yr}$$

$$Secondary\ PM_{2.5}\ from\ NO_2 = 87.60\ \frac{lb\ NO_2}{hr} \times 0.025 \times 1.74 = 3.81\ \frac{ton\ PM_{2.5}}{yr}$$

Secondary emissions during start-up/shutdown operations are also calculated with the NESCAUM recommended method. Table 10.5 presents the secondary $PM_{2.5}$ emissions added to the modeling input files for start-up/shutdown operations.

TABLE 10-5
CALCULATED SECONDARY $PM_{2.5}$ EMISSIONS
FOR STEADY-STATE OPERATIONS

Parameter		Start-Ups						Shut Downs	
		Cold Start		Warm Start		Hot Start			
		NG	ULSD	NG	ULSD	NG	ULSD	NG	ULSD
$PM_{2.5}$	(lb/hr)	5.91	3.36	3.30	2.91	2.99	4.26	1.81	3.97

11.0 MODELING RESULTS

The Linden 7 combustion turbine stack, emission point PT1, was modeled with a unit emission rate (1 pound per hour) in order to determine maximum 1-hour, 3-hour, 8-hour, 24-hour and annual impacts associated with emissions released from the stack. The maximum requested emission rate of each compound included in the permit is multiplied by the averaging period appropriate unit emission rate modeling result to obtain the maximum predicted impact. The following sections discuss the results for each compound. All AERMOD, AERSURFACE, AERMAP, NED files, and Meteorological Data files along with any spreadsheet files developed to present the final analysis of results are provided in electronic format (CD-ROM) as Attachment F and a Table of Contents for the CD-ROM is provided as Attachment G.

11.1 UNIT EMISSION RATE MODELING RESULTS

The unit emission rate modeling run for steady-state conditions included 18 operating scenarios. Variable operating parameters include fuels (natural gas and ULSD), load level (100% load, 75% load, and 50% load), and ambient temperature [low temperature (10˚F for natural gas and 0˚F for ULSD), medium temperature (50˚F) and high temperature (92˚F)]. The maximum predicted impact for each scenario for each averaging period are provided in Table 11-1. Five years of meteorological data were used in the modeling, each in a separate run. Table 11-1 lists the maximum impact over the five-year span. The maximum impact for each averaging period are highlighted in *red.*

TABLE 11-1
STEADY-STATE UNIT EMISSION RATE MODELING RESULTS
MAXIMUM IMPACT ACROSS FIVE YEARS OF METEOROLOGICAL DATA

Scenario			Maximum Unit Emission Rate Impact				
			1-Hour	3-Hour	8-Hour	24-Hour	Annual
Fuel	Load	Amb. Temp.	(μg/m³)/(lb/hr)	(μg/m³)/(lb/hr)	(μg/m³)/(lb/hr)	(μg/m³)/(lb/hr)	(μg/m³)/(lb/hr)
NG	100	Low	0.09062	0.07749	0.06164	0.03099	0.00275
	75	Low	0.10478	0.09252	0.07392	0.03838	0.00339
	50	Low	***0.13955***	***0.12788***	***0.10395***	***0.05356***	***0.0048***
	100	Medium	0.09032	0.07687	0.06117	0.03074	0.00273
	75	Medium	0.10287	0.08943	0.07165	0.03702	0.00327
	50	Medium	0.13296	0.12181	0.09901	0.05096	0.00455
	100	High	0.08811	0.07355	0.05855	0.02931	0.0026
	75	High	0.10367	0.08983	0.07187	0.03718	0.00328

Scenario			Maximum Unit Emission Rate Impact				
			1-Hour	3-Hour	8-Hour	24-Hour	Annual
Fuel	Load	Amb. Temp.	(μg/m³)/(lb/hr)	(μg/m³)/(lb/hr)	(μg/m³)/(lb/hr)	(μg/m³)/(lb/hr)	(μg/m³)/(lb/hr)
	50	High	0.12209	0.11101	0.08875	0.04589	0.00408
ULSD	100	Low	0.07491	0.05914	0.04889	0.02384	0.00207
	75	Low	0.09156	0.07414	0.05983	0.03015	0.00266
	50	Low	0.11076	0.09757	0.07766	0.04013	0.00355
	100	Medium	0.07606	0.06027	0.04961	0.02424	0.00211
	75	Medium	0.09401	0.0766	0.06194	0.03136	0.00276
	50	Medium	0.11046	0.09725	0.07738	0.04	0.00354
	100	High	0.08211	0.06562	0.05301	0.02622	0.00231
	75	High	0.09963	0.08321	0.06697	0.03428	0.00302
	50	High	0.11306	0.09991	0.07973	0.04109	0.00364

The unit emission rate modeling run for start-up/shutdown conditions included 8 operating scenarios. Variable operating parameters include fuels (natural gas and ULSD) and start-up conditions (cold start-up, warm start-up, hot start-up, and shutdown). The maximum predicted impact for each scenario for each averaging period are provided in Table 11-2 for natural gas and in Table 11-3 for ULSD. Five years of meteorological data were used in the modeling, each in a separate run. Tables 11-2 and 11-3 lists the maximum impact for each year. The maximum impact for each averaging period are highlighted in *red*.

TABLE 11-2
UNIT EMISSION RATE MODELING RESULTS
NATURAL GAS START-UP/SHUTDOWN CONDITIONS

Averaging Period	Year	Natural Gas			
		Cold Start	Warm Start	Hot Start	Shutdown
		(μg/m^3)/(lb/hr)	(μg/m^3)/(lb/hr)	(μg/m^3)/(lb/hr)	(μg/m^3)/(lb/hr)
1-Hour	2010	0.30976	***0.18465***	0.11481	***0.18607***
	2011	0.30955	0.17924	0.11042	0.18049
	2012	0.30597	0.17788	***0.11672***	0.17949
	2013	***0.32281***	0.178	0.11464	0.18015
	2014	0.3156	0.18333	0.10967	0.18498
3-Hour	2010	0.26437	0.15448	0.09432	0.15569
	2011	0.26518	0.16215	0.09988	0.16357
	2012	0.25804	0.14051	0.08879	0.14142
	2013	***0.27582***	***0.16995***	***0.10681***	***0.17146***
	2014	0.27322	0.15349	0.09765	0.15459

TABLE 11-3
UNIT EMISSION RATE MODELING RESULTS
ULSD START-UP/SHUTDOWN CONDITIONS

Averaging Period	Year	ULSD			
		Cold Start	Warm Start	Hot Start	Shutdown
		(μg/m^3)/(lb/hr)	(μg/m^3)/(lb/hr)	(μg/m^3)/(lb/hr)	(μg/m^3)/(lb/hr)
1-Hour	2010	0.23104	***0.14365***	0.09247	***0.1419***
	2011	0.22529	0.13948	0.08749	0.13828
	2012	0.22882	0.13814	***0.09822***	0.13686
	2013	0.23342	0.14166	0.09083	0.14044
	2014	***0.24299***	0.1385	0.08497	0.13688
3-Hour	2010	0.19797	0.11933	0.07253	0.1179
	2011	0.20504	0.12645	0.08090	0.12514
	2012	0.17869	0.11079	0.07107	0.10993
	2013	***0.21630***	***0.13202***	***0.08231***	***0.13059***
	2014	0.20445	0.12096	0.07482	0.11965

11.2 NAAQS MODELING RESULTS

The modeling results for each of the criteria pollutants are discussed in the following sections.

11.2.1 NO_2

Table 11-4 presents the steady-state Area of Impact (AOI) modeling (i.e., Linden 7 modeled by itself) results for NO_2.

TABLE 11-4
STEADY-STATE NO_2 UNIT EMISSION RATE MODELING RESULTS

Averaging Period	Emission Rate, Q	Unit Emission Rate Impact	C	SIL	Result
	(lb/hr)	(μg/m³)/(lb/hr)	(μg/m³)	(μg/m³)	
1-Hour	40.4	0.13955	5.64	7.5	Insignificant
Annual	20.00[1]	0.0048	0.096	1	Insignificant

1 Based on annualized yearly emissions (87.6 tpy * 2,000 lb/ton / 8,760 hr/yr).

The modeling results for NO_2 shown in Table 11-4 conservatively assume that 100% of the NO_X emitted is converted to NO_2. The 1-hour result assumes the maximum hourly emission rate (which occurs while firing ULSD at 100% load during low ambient temperatures) coincides with the worst-case operating parameters (which occur while firing natural gas at 50% load during low ambient temperatures). In addition, the 1-hour result is conservatively based on the maximum 1-hour impact predicted during the 5-year period and not the highest 5-year average predicted impact which is allowed due to the nature of the 1-hour standard. Lastly, the annual result assumes the worst-case operating parameters (which occur while firing natural gas at 50% load during low ambient temperatures) occurs during the enter year. As shown in Table 11-4, the maximum 1-hour and annual impacts are less than their respective SILs. According to EPA guidelines, the impacts are insignificant and the demonstration is complete.

Table 11-5 presents the Start-Up/Shutdown (SU/SD) Area of Impact (AOI) modeling (i.e., Linden 7 modeled by itself) results for NO_2. As discussed in Section 5.1, intermittent sources of NO_X, including cold startups while firing natural gas, and the startups and shutdowns while firing ULSD, were excluded from the 1-hour NO_2 impacts analysis due to the limited number of annual events and limited duration of the individual events.

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TABLE 11-5
SU/SD NO_2 UNIT EMISSION RATE MODELING RESULTS

Fuel	Averaging Period	Scenario	Emission Rate, Q	Unit Emission Rate Impact	C	SIL	Result
			(lb/hr)	(µg/m³)/(lb/hr)	(µg/m³)	(µg/m³)	
Natural Gas	1-Hour	Warm Start	43.85	0.18465	7.287(1)	7.5	Insignificant
		Hot Start	37.65	0.11672	4.395(2)		Insignificant
		Shutdown	22.49	0.18607	4.185(2)		Insignificant

1 Assumes 90% conversion of NO_X to NO_2.
2 Assumes 100% conversion of NO_X to NO_2.

The maximum predicted impact for warm starts assumes a NO_X to NO_2 conversion rate of 90%. This is based on the maximum ARM2 conversion rate of 90%. The conversion rates for hot starts and shutdowns is conservatively assumed to be 100%.

As shown in Table 11-5, the maximum 1-hour impacts from SU/SD events are less than the SIL. According to EPA guidelines, the impacts are insignificant and the demonstration is complete. To show compliance with the NAAQS, NJDEP has requested that the AOI modeling results be added to the background and compared to the NAAQS. Table 11-6 presents such a comparison.

TABLE 11-6
NO_2 NAAQS MODELING RESULTS

Averaging Period	Predicted Impact	Rank	Background Concentration	Total Concentration	NAAQS/ NJAAQS	Result
	(µg/m³)		(µg/m³)	(µg/m³)	(µg/m³)	
1-Hour	7.29	H1H	122.6	129.9	188	Less than Standard
Annual	0.096	H1H	41.5	41.6	100	Less than Standard

As shown in Table 11-6, the conservative maximum 1-hour NO_2 impact (7.29 µg/m³) (the 5-year average eighth highest impact is allowed to be used) plus the background NO_2 concentration (122.6 µg/m³) is well below the NAAQS/NJAAQS of 188 µg/m³. In addition, the annual NO_2 impact (0.096 µg/m³) plus the annual background NO_2 concentration (41.5 µg/m³) is well below the NAAQS/NJAAQS of 100 µg/m³.

11.2.2 CO

Table 11-7 presents the AOI modeling (i.e., Linden 7 modeled by itself) results for CO.

TABLE 11-7
STEADY-STATE CO UNIT EMISSION RATE MODELING RESULTS

Averaging Period	Emission Rate, Q (lb/hr)	Unit Emission Rate Impact (μg/m³)/(lb/hr)	C (μg/m³)	SIL (μg/m³)	Result
1-Hour	36.90	0.13955	5.15	2,000	Insignificant
8-Hour	36.90	0.10395	3.84	500	Insignificant

As shown in Table 11-7, the predicted 1-hour and 8-hour impacts for Linden 7 modeled by itself are well below their respective SILs. According to EPA guidelines, the impacts are insignificant and the demonstration is complete.

Table 11-8 presents the Start-Up/Shutdown (SU/SD) Area of Impact (AOI) modeling (i.e., Linden 7 modeled by itself) results for CO.

TABLE 11-8
SU/SD CO UNIT EMISSION RATE MODELING RESULTS

Fuel	Averaging Period	Scenario	Emission Rate, Q (lb/hr)	Unit Emission Rate Impact (μg/m³)/(lb/hr)	C (μg/m³)	SIL (μg/m³)	Result
Natural Gas	1-Hour	Cold Start	555.8	0.32281	179.42	2,000	Insignificant
		Warm Start	142.44	0.18465	153.30		Insignificant
		Hot Start	152.65	0.11672	26.30		Insignificant
		Shutdown	94.83	0.18607	24.21		Insignificant
	8-Hour(1)	Cold Start	555.8	0.27582	153.30	500	Insignificant
		Warm Start	142.44	0.16995	24.21		Insignificant
		Hot Start	152.65	0.10681	16.30		Insignificant
		Shutdown	94.83	0.17146	16.26		Insignificant

Fuel	Averaging Period	Scenario	Emission Rate, Q	Unit Emission Rate Impact	C	SIL	Result
			(lb/hr)	(μg/m³)/(lb/hr)	(μg/m³)	(μg/m³)	
ULSD	1-Hour	Cold Start	547.04	0.24299	132.93	2,000	Insignificant
		Warm Start	181.56	0.14365	26.08		Insignificant
		Hot Start	244.15	0.09822	23.98		Insignificant
		Shutdown	80.87	0.1419	11.48		Insignificant
	8-Hour(1)	Cold Start	547.04	0.2163	118.32	500	Insignificant
		Warm Start	181.56	0.13202	23.97		Insignificant
		Hot Start	244.15	0.08231	20.10		Insignificant
		Shutdown	80.87	0.13059	10.56		Insignificant

1 Conservatively assumes the 8-hour impacts equal the modeled 3-hour impacts.

The predicted concentrations presented in Table 11-8 assume that the operating scenario occurs for the duration of the averaging period. This is a conservative assumption for the 1-hour hot start and shutdown results as well as all of the 8-hour results. As shown in Table 11-8, the maximum 1-hour and 8-hour impacts from SU/SD events are less than their respective SILs. According to EPA guidelines, the impacts are insignificant and the demonstration is complete.

To show compliance with the NAAQS, NJDEP has requested that the AOI modeling results be added to the background and compared to the NAAQS. Table 11-9 presents such a comparison.

TABLE 11-9
CO NAAQS MODELING RESULTS

Averaging Period	Predicted Impact	Rank	Background	Total Concentration	NAAQS/ NJAAQS	Result
	(μg/m³)		(μg/m³)	(μg/m³)	(μg/m³)	
1-Hour	179	H1H	3,220	3,399	40,000	Less than Standard
8-Hour	153	H1H	2,070	2,2223	10,000	Less than Standard

As shown in Table 11-9, the highest 1-hour CO impact (179 μg/m³) (the second highest impact is allowed to be used) plus the 1-hour background CO concentration (3,220 μg/m³) is well below the NAAQS/NJAAQS of 40,000 μg/m³. In addition, the highest 8-hour CO impact (153 μg/m³) (the second highest impact is allowed to be used) plus the 8-hour background CO concentration (2,070 μg/m³) is well below the NAAQS/NJAAQS of 10,000 μg/m³.

11.2.3 SO_2

Table 11-10 presents the AOI modeling (i.e., Linden 7 modeled by itself) results for SO_2.

TABLE 11-10
STEADY-STATE SO_2 UNIT EMISSION RATE MODELING RESULTS

Averaging Period	Emission Rate, Q (lb/hr)	Unit Emission Rate Impact (μg/m³)/(lb/hr)	C (μg/m³)	SIL (μg/m³)	Result
1-Hour	4.8	0.13955	0.670	7.8	Insignificant
3-Hour	4.8	0.12788	0.614	25	Insignificant
24-Hour	4.8	0.05356	0.257	5	Insignificant
Annual	2.79[1]	0.0048	0.0134	1	Insignificant

1 Based on annualized yearly emissions (12.22 tpy * 2,000 lb/ton / 8,760 hr/yr).

The 1-hour result is conservatively based on the maximum 1-hour impact predicted during the 5-year period and not the highest 5-year average predicted impact which is allowed due to the nature of the 1-hour standard. As shown in Table 11-10, the maximum 1-hour, 3-hour, 24-hour, and annual impacts are less than their respective SILs. According to EPA guidelines, the impacts are insignificant and the demonstration is complete.

Table 11-11 presents the Start-Up/Shutdown (SU/SD) Area of Impact (AOI) modeling (i.e., Linden 7 modeled by itself) results for SO_2.

TABLE 11-11
SU/SD SO_2 UNIT EMISSION RATE MODELING RESULTS

Fuel	Averaging Period	Scenario	Emission Rate, Q	Unit Emission Rate Impact	C	SIL	Result
			(lb/hr)	(μg/m³)/(lb/hr)	(μg/m³)	(μg/m³)	
Natural Gas	1-Hour	Warm Start	1.72	0.18465	0.318	7.8	Insignificant
		Hot Start	2.59	0.11672	0.302		Insignificant
		Shutdown	1.73	0.18607	0.322		Insignificant
	3-Hour	Warm Start	1.72	0.16995	0.292	25	Insignificant
		Hot Start	2.59	0.10681	0.277		Insignificant
		Shutdown	1.73	0.17146	0.297		Insignificant

The predicted concentrations presented in Table 11-11 assume that the operating scenario occurs for the duration of the averaging period. This is a conservative assumption for the 1-hour hot start and shutdown results as well as all of the 3-hour results. As shown in Table 11-11, the maximum 1-hour and 3-hour impacts from SU/SD events are less than their respective SILs. According to EPA guidelines, the impacts are insignificant and the demonstration is complete.

To show compliance with the NAAQS, NJDEP has requested that the AOI modeling results be added to the background and compared to the NAAQS. Table 11-12 presents such a comparison.

TABLE 11-12
SO_2 NAAQS MODELING RESULTS

Averaging Period	Predicted Impact	Rank	Background	Total Concentration	NAAQS/ NJAAQS	Result
	(μg/m³)		(μg/m³)	(μg/m³)	(μg/m³)	
1-Hour	0.670	H1H	31.4	32.1	196	Less than Standard
3-Hour	0.614	H1H	55	55.6	1,300	Less than Standard
24-Hour	0.257	H1H	13.1	13.4	365	Less than Standard
Annual	0.0134	H1H	1.6	1.6	80	Less than Standard

As shown in Table 11-12, the conservative maximum 1-hour SO_2 impact (0.670 μg/m^3) (the 5-year average fourth highest impact is allowed to be used) plus the background SO_2 concentration (31.4 μg/m^3) is well below the NAAQS/NJAAQS of 196 μg/m^3. Also, the highest 3-hour SO_2 impact (0.614 μg/m^3) (the second highest impact is allowed to be used) plus the 3-hour background SO_2 concentration (55 μg/m^3) is well below the NAAQS/NJAAQS of 1,300 μg/m^3. In addition, the highest 24-hour SO_2 impact (0.257 μg/m^3) (the second highest impact is allowed to be used) plus the 24-hour background SO_2 concentration (13.1 μg/m^3) is well below the NAAQS/NJAAQS of 365 μg/m^3. Lastly, the annual SO_2 impact (0.0134 μg/m^3) plus the annual background SO_2 concentration (1.6 μg/m^3) is well below the NAAQS/NJAAQS of 80 μg/m^3.

11.2.4 $PM_{2.5}$

Table 11-13 presents the AOI modeling (i.e., Linden 7 modeled by itself) results for $PM_{2.5}$.

TABLE 11-13
STEADY-STATE $PM_{2.5}$ AOI MODELING RESULTS

Averaging Period	Emission Rate, Q	Unit Emission Rate Impact	C	SIL	Result
	(lb/hr)	(μg/m^3)/(lb/hr)	(μg/m^3)	(μg/m^3)	
24-Hour	N/A	1.031(1)		1.2(1)	Insignificant
Annual	14.29(2)	0.0048(3)	0.0686	0.3(4)	Insignificant

1 Based on 5-year average of high first high 24-hour impacts.
2 Based on annualized yearly emissions (62.61 tpy * 2,000 lb/ton / 8,760 hr/yr).
3 Based on 5-year average of high annual impacts.
4 Based on 3-year average of high annual impacts. Note that the proposed annual $PM_{2.5}$ SIL is 0.2 μg/m3.

Unlike modeling results presented earlier which are based on a Unit Emission Rate modeling run, a $PM_{2.5}$ modeling run was executed with actual $PM_{2.5}$ emission rates input for each steady-state operating scenarios. The model predicted the maximum 5-year average for each operating scenario. The maximum impact presented in Table 11-13 occurs while firing ULSD at 100% load during medium ambient temperatures. As shown in Table 11-13, the maximum 24-hour and annual impacts are less than their respective SILs. According to EPA guidelines, the impacts are insignificant and the demonstration is complete.

Table 11-14 presents the Start-Up/Shutdown (SU/SD) Area of Impact (AOI) modeling (i.e., Linden 7 modeled by itself) results for $PM_{2.5}$.

TABLE 11-14
SU/SD $PM_{2.5}$ MODELING RESULTS

Fuel	Averaging Period	Scenario	C (µg/m³)	SIL (µg/m³)	Result
Natural Gas	24-Hour	Cold Start	0.975	1.2	Insignificant
		Warm Start	0.959		Insignificant
		Hot Start	0.956		Insignificant
		Shutdown	0.967		Insignificant
ULSD	24-Hour	Cold Start	0.980	1.2	Insignificant
		Warm Start	0.968		Insignificant
		Hot Start	0.965		Insignificant
		Shutdown	0.963		Insignificant

The results presented in Table 11-14 are based on operating parameters and emission rates presented in Table 6-1. As shown in Table 11-14, the maximum 24-hour impacts from SU/SD events are less than the SIL. According to EPA guidelines, the impacts are insignificant and the demonstration is complete.

To show compliance with the NAAQS, NJDEP has requested that the AOI modeling results be added to the background and compared to the NAAQS. Table 11-15 presents such a comparison.

TABLE 11-15
$PM_{2.5}$ NAAQS MODELING RESULTS

Averaging Period	Predicted Impact (µg/m³)	Rank	Background (µg/m³)	Total Concentration (µg/m³)	NAAQS/ NJAAQS (µg/m³)	Result
24-Hour	1.031	H8H (5-yr average)	24	25.0	35	Less than Standard
Annual	0.0686	H1H	9.9	10.0	12	Less than Standard

As shown in Table 11-15, the high eighth high (H8H) 24-hour $PM_{2.5}$ impact (1.031 $\mu g/m^3$) plus the background $PM_{2.5}$ concentration (24 $\mu g/m^3$) is below the NAAQS/NJAAQS of 35 $\mu g/m^3$. In addition, the annual $PM_{2.5}$ impact (0.0686 $\mu g/m^3$) plus the annual background $PM_{2.5}$ concentration (9.9 $\mu g/m^3$) is below the NAAQS/NJAAQS of 12 $\mu g/m^3$.

11.2.5 PM_{10}

Table 11-16 presents the AOI modeling (i.e., Linden 7 modeled by itself) results for PM_{10}.

TABLE 11-16
STEADY-STATE PM_{10} UNIT EMISSION RATE MODELING RESULTS

Averaging Period	Emission Rate, Q	Unit Emission Rate Impact	C	SIL	Result
	(lb/hr)	($\mu g/m^3$)/(lb/hr)	($\mu g/m^3$)	($\mu g/m^3$)	
24-Hour	49.17	0.05356	2.63	5	Insignificant
Annual	14.29[1]	0.0048	0.0686	1	Insignificant

1 Based on annualized yearly emissions (62.61 tpy * 2,000 lb/ton / 8,760 hr/yr).

As shown in Table 11-16, the predicted 24-hour and annual impacts for Linden 7 modeled by itself are less than their respective SILs. According to EPA guidelines, the impacts are insignificant and the demonstration is complete.

Table 11-17 presents the Start-Up/Shutdown (SU/SD) Area of Impact (AOI) modeling (i.e., Linden 7 modeled by itself) results for PM_{10}.

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TABLE 11-17
SU/SD PM_{10} MODELING RESULTS

Fuel	Averaging Period	Scenario	Emission Rate, Q	Unit Emission Rate Impact	C	SIL	Result
			(lb/hr)	(μg/m³)/(lb/hr)	(μg/m³)	(μg/m³)	
Natural Gas	24-Hour	Cold Start	9.17414	0.27582	2.53	5	Insignificant
		Warm Start	8.839984	0.16995	1.50		Insignificant
		Hot Start	11.30392	0.10681	1.21		Insignificant
		Shutdown	20.12477	0.17146	3.45		Insignificant
ULSD	24-Hour	Cold Start	18.16172	0.2163	3.93	5	Insignificant
		Warm Start	27.62332	0.13202	3.65		Insignificant
		Hot Start	41.31758	0.08231	3.40		Insignificant
		Shutdown	23.21656	0.13059	3.03		Insignificant

The emission rates presented in Table 11-17 include secondary $PM_{2.5}$ emissions in the PM_{10} emission rates. The predicted concentrations presented in Table 11-17 assume that the operating scenario occurs for the duration of the 24-hour averaging period. This is a conservative assumption for all of the SU/SD scenarios. As shown in Table 11-17, the maximum 24-hour impacts from SU/SD events are less than the SIL. According to EPA guidelines, the impacts are insignificant and the demonstration is complete.

To show compliance with the NAAQS, NJDEP has requested that the AOI modeling results be added to the background and compared to the NAAQS. Table 11-18 presents such a comparison.

TABLE 11-18
PM_{10} NAAQS MODELING RESULTS

Averaging Period	Predicted Impact	Rank	Background	Total Concentration	NAAQS/ NJAAQS	Result
	(μg/m³)		(μg/m³)	(μg/m³)	(μg/m³)	
24-Hour	2.63	H1H	40	42.63	150	Less than Standard
Annual	0.0686	H1H	19	19.1	NA	---

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As shown in Table 11-18, the conservative maximum 24-hour PM_{10} impact (2.63 µg/m^3) plus the background PM_{10} concentration (40 µg/m^3) is well below the NAAQS/NJAAQS of 150 µg/m^3.

11.3 PSD INCREMENT ANALYSES

As shown in the previous section, the maximum impact of all criteria pollutants is less than their respective SILs. Since the impacts are less than the SILs, the demonstration is complete and no additional modeling is required. The following sections compare the maximum modeled impacts with the allowable increment consumption concentrations.

11.3.1 NO_2 Increment Consumption

NO_2 has an increment limit for the annual averaging period. Table 11-19 compares the maximum predicted annual impact with the PSD increment concentration.

TABLE 11-19
NO_2 PSD INCREMENT ANALYSIS

Averaging Period	Predicted Impact (µg/m^3)	Rank	PSD Increment (µg/m^3)	Result
Annual	0.096	H1H	25	Less than increment

The maximum predicted impact assumes 100% of the NO_X is converted to NO_2. As shown in Table 11-19, the maximum predicted annual NO_2 concentration is less than the allowable PSD increment level.

11.3.2 SO_2 Increment Consumption

SO_2 has an increment limit for the 3-hour, 24-hour, and annual averaging periods. Table 11-20 compares the maximum predicted impacts with the PSD increment concentrations.

TABLE 11-20
SO_2 PSD INCREMENT MODELING RESULTS

Averaging Period	Predicted Impact ($\mu g/m^3$)	Rank	PSD Increment ($\mu g/m^3$)	Result
3-Hour	0.614	H2H	512	Less than increment
24-Hour	0.257	H2H	91	Less than increment
Annual	0.0134	H2H	20	Less than increment

As shown in Table 11-20, the maximum predicted 3-hour, 24-hour, and annual SO_2 concentrations are less than their respective allowable PSD increment levels.

11.3.3 PM_{10} Increment Consumption

PM_{10} has an increment limit for the 24-hour and annual averaging periods. Table 11-21 compares the maximum predicted impacts with the PSD increment concentrations.

TABLE 11-21
PM_{10} PSD INCREMENT MODELING RESULTS

Averaging Period	Predicted Impact ($\mu g/m^3$)	Rank	PSD Increment ($\mu g/m^3$)	Result
24-Hour	3.93	H1H	30	Less than increment
Annual	0.0686	H1H	17	Less than increment

As shown in Table 11-21, the maximum predicted 24-hour and annual PM_{10} concentrations are less than their respective allowable PSD increment levels.

11.3.4 $PM_{2.5}$ Increment Consumption

$PM_{2.5}$ has an increment limit for the 24-hour and annual averaging periods. Table 11-22 compares the maximum predicted impacts with the PSD increment concentrations.

TABLE 11-22
$PM_{2.5}$ PSD INCREMENT MODELING RESULTS

Averaging Period	Predicted Impact (µg/m³)	Rank	PSD Increment (µg/m³)	Result
24-Hour	3.93[1]	H1H	9	Less than increment
Annual	0.0686	H1H	4	Less than increment

1 Based on cold start using ULSD fuel and conservatively assuming 24-hour impact equals 3-hour impact.

The 24-hour impact listed in Table 11-22 is the highest 3-hour impact (conservatively assumed to equal the 24-hour impact). The high second high value is generally used in the analysis. As shown in Table 11-22, the maximum predicted 24-hour and annual $PM_{2.5}$ concentrations are less than their respective allowable PSD increment levels. However, meeting the SIL for $PM_{2.5}$ can no longer be used as the single demonstrate for compliance with the $PM_{2.5}$ increment limit.

October 20, 2010 is the established major source baseline date for $PM_{2.5}$ increments and October 20, 2011 is the trigger date. Table 11-23 lists the ambient air $PM_{2.5}$ concentrations at the monitor used as the $PM_{2.5}$ background monitor for this project, Monitor ID No. 34-039-0004 (Elizabeth Lab).

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TABLE 11-23
$PM_{2.5}$ MONITORING DATA SINCE BASELINE DATE

Year	$PM_{2.5}$ Concentration Averaging Period	
	24-hour (µg/m³)	Annual (µg/m³)
2011	33	12.2
2012	26	10.7
2013	31	10.7
2014	26	10.2
2015	27	10.2
2016	20	9.1

As shown in Table 11-23 the 24-hour and annual concentrations of $PM_{2.5}$ have decreased since the trigger date. Conservatively using 2012 as the baseline concentration shows that the ambient 24-hour and annual concentrations of $PM_{2.5}$ have decreased by 6 µg/m³ and 2.6 µg/m³, respectively, resulting in an increment expansion for the area. Therefore, the conservative impacts listed in Table 11-22 will not create or contribute to an exceedance of the $PM_{2.5}$ PSD increment limits.

11.4 RISK ASSESSMENT RESULTS

The Linden 7 combustion turbine stack, emission point PT1, was modeled with a unit emission rate (1 pound per hour) in order to determine maximum 1-hour, 24-hour and annual impacts associated with emissions emitted from the stack. Estimated maximum short-term and annual emission rates (units of lb/hr) for acrolein, ammonia, arsenic (inorganic), benzene, benzo(a)pyrene, 1-3-butadiene, cadmium, formaldehyde, lead, mercury, manganese, selenium, and toluene were multiplied by the predicted impacts (units of (µg/m3)/(lb/hr)) to obtain predicted impacts (units of µg/m3) for each compound, as applicable.

The maximum predicted 1-year average annual impact of each carcinogenic compound (i.e., arsenic (inorganic), benzene, benzo(a)pyrene, 1,3-butadiene, cadmium, formaldehyde, and lead) was multiplied by its associated unit risk factor (URF) to calculate an Incremental Risk (IR) for each compound. This is conservative since it is permissible to use the maximum 5-year average concentration. An individual HAP's incremental risk is considered to be negligible if the IR is less than or equal to one in a hundred thousand (10.0 E-06).

The maximum predicted 1-year average annual impact of acrolein, ammonia, arsenic (inorganic), benzene, 1,3-butadiene, cadmium, formaldehyde, mercury, selenium, and toluene was divided by its reference concentration (RfC) to calculate a Hazard Quotient (HQ). The maximum predicted 24-hour impacts of acrolein, ammonia, arsenic (inorganic), benzene, 1,3-butadiene, formaldehyde, lead, mercury, and toluene were divided by their associated short-term RfC (RfCST) to calculate a short-term HQ for each compound. If the HQ is less than or equal to 1 then the risk is considered negligible.

11.4.1 Unit Emission Rate Modeling Results

Table 11-24 below presents the results of the unit emission rate modeling discussed previously in Section 11.1 and presented in Table 11-1. These predicted impacts are used in the subsequent analyses.

TABLE 11-24
MODELING RESULTS

Year		Maximum Impact	
	1-Hour	24-Hour	Annual
	($\mu g/m^3$)/(lb/hr)	($\mu g/m^3$)/(lb/hr)	($\mu g/m^3$)/(lb/hr)
2014	0.13955	0.05356	0.0048

11.4.2 Carcinogenic Risk Evaluations

The predicted concentration, C, is calculated by multiplying the annualized pound per hour emission rate (Q) times the Unit Emission Rate Impact. The Incremental Risk, IR, is calculated by multiplying C times the Unit Risk Factor, URF. If IR is less than 10.0 E-06, then the compound's impact is considered negligible and no further evaluation is required. The long-term (1-year average) risk screening evaluations for carcinogenic compounds are presented in Table 11-25. As depicted, the IR of each compound is less than 10.0 E-06 and the risk associated with each compound is therefore considered to be negligible. No further evaluation is required.

TABLE 11-25
ANNUAL LEVEL 2 RISK SCREENING RESULTS FOR CARCINOGENIC EFFECTS

Compound	CAS	Annual Emission Rate, Q		Unit Emission Rate Impact	C	URF	IR	Result
		(ton/yr)	(lb/hr)	(μg/m³)/(lb/hr)	(μg/m³)	(μg/m³)⁻¹		
Arsenic	---	0.0114	0.002612	0.0048	1.25E-05	4.30E-03	5.4E-08	Negligible
Benzene	71-43-2	0.0899	0.020519	0.0048	9.85E-05	7.80E-06	7.7E-10	Negligible
Benzo(a)pyrene	50-32-8	0.0637	0.014532	0.0048	6.98E-05	1.10E-03	7.7E-08	Negligible
1,3-Butadiene	106-99-0	0.0210	0.004784	0.0048	2.30E-05	3.00E-05	6.9E-10	Negligible
Cadmium	---	0.00499	0.001140	0.0048	5.47E-06	4.20E-03	2.3E-08	Negligible
Formaldehyde	50-00-0	2.055	0.469067	0.0048	2.25E-03	1.30E-05	2.9E-08	Negligible
Lead	---	0.00959	0.002190	0.0048	1.05E-05	1.20E-05	1.3E-10	Negligible

11.4.3 Non-Carcinogenic Evaluations

The long-term (5-year average) and short-term (24-hour) risk screening evaluations for non-carcinogenic compounds are presented in Tables 11-26 and 11-27, respectively.

11.4.4 Long-Term Exposure

The predicted concentration, C, is calculated by multiplying the annualized pound per hour emission rate times the Unit Emission Rate Impact. The Hazard Quotient, HQ, is calculated by dividing C by the Reference concentration, RfC. If HQ is less than 1.0, then the compound's impact is considered negligible and no further evaluation is required. As shown in Table 11-26, the annual HQ of each compound is less than 1.0 and the risk associated with each compound is therefore considered to be negligible. No further evaluation is required.

TABLE 11-26
ANNUAL LEVEL 2 RISK SCREENING RESULTS FOR NON-CARCINOGENIC EFFECTS

Compound	CAS	Annual Emission Rate, Q		Unit Emission Rate Impact	C	RfC	HQ	Result
		(ton/yr)	(lb/hr)	(μg/m³)/(lb/hr)	(μg/m³)	(μg/m³)		
Acrolein	107-02-8	0.0706	0.01611	0.0048	7.73E-05	0.02	3.87E-03	Negligible
Ammonia	7664-41-7	77.2400	17.63470	0.0048	8.46E-02	100	8.46E-04	Negligible
Arsenic	---	0.0114	0.00261	0.0048	1.25E-05	0.015	8.36E-04	Negligible
Benzene	71-43-2	0.0899	0.02052	0.0048	9.85E-05	3	3.28E-05	Negligible
1,3-Butadiene	106-99-0	0.0210	0.00478	0.0048	2.30E-05	2	1.15E-05	Negligible
Cadmium	---	0.00499	0.00114	0.0048	5.47E-06	0.02	2.74E-04	Negligible
Formaldehyde	50-00-0	2.055	0.46907	0.0048	2.25E-03	9	2.50E-04	Negligible
Mercury	7439-97-6	0.00125	0.00028	0.0048	1.37E-06	0.03	4.56E-05	Negligible
Selenium	---	0.0260	0.00594	0.0048	2.85E-05	20	1.42E-06	Negligible
Toluene	108-88-3	1.433	0.32724	0.0048	1.57E-03	5000	3.14E-07	Negligible

11.4.5 Short-Term Exposure

The predicted concentration, C, is calculated by multiplying the pound per hour emission rate times the Unit Emission Rate Impact. The Hazard Quotient, HQ, is calculated by dividing C by the short-term reference concentration, RfCST. If the HQ is less than 1.0, then the compound's impact is considered negligible and no further evaluation is required. As shown in Table 11-27, the short-term HQ of each compound is less than 1.0 and the risk associated with each compound is therefore considered to be negligible. No further evaluation is required.

TABLE 11-27
SHORT-TERM LEVEL 2 RISK SCREENING RESULTS FOR NON-CARCINOGENIC EFFECTS

Compound	CAS	Hourly Emission Rate, Q (lb/hr)	Averaging Period of RFC (hr)	Appropriate Unit Emission Rate Impact (μg/m³)/(lb/hr)	RfC (μg/m³)	C (μg/m³)	HQ	Result
Acrolein	107-02-8	0.0161	1	0.13955	2.5	2.25E-03	8.99E-04	Negligible
Ammonia	7664-41-7	18.7000	1	0.13955	3200	2.61E+00	8.15E-04	Negligible
Arsenic	---	0.0286	1	0.13955	0.2	3.99E-03	2.00E-02	Negligible
Benzene	71-43-2	0.1430	1	0.13955	27	2.00E-02	7.39E-04	Negligible
1,3-butadiene	106-99-0	0.0416	1	0.13955	660	5.81E-03	8.80E-06	Negligible
Formaldehyde	50-00-0	0.728	1	0.13955	55	1.02E-01	1.85E-03	Negligible
Lead	---	0.0240	24	0.05356	0.1	1.28E-03	1.28E-02	Negligible
Toluene	108-88-3	0.00312	1	0.13955	0.6	4.35E-04	7.26E-04	Negligible

11.5 ADDITIONAL IMPACTS ANALYSIS

The additional impacts analysis is required for major sources subject to PSD review. The purpose of the additional impacts analysis is to demonstrate that visibility, soils and vegetation will not be impaired due to operation of the Project. In addition, an analysis of the air quality impacts due to growth associated with the Project must be addressed.

11.5.1 Soil and Vegetation Analysis

Maximum predicted impacts of criteria pollutants (modeled predictions plus background concentrations) are compared to the NJAAQS and NAAQS in Section 11.2.3. In addition, 3-hour and annual SO_2 impacts are compared to the screening values shown in Table 11-28. The screening values are based on the sensitive vegetation screening values in "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals" (EPA document 450/2-81-078).

TABLE 11-28
SOILS AND VEGETATION SCREENING VALUES

:Pollutant	Averaging Period	Predicted Impact ($\mu g/m^3$)	Rank	Background ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	Screening Value ($\mu g/m^3$)
SO_2	3-Hour	0.614	H1H	31.4	32.1	786
	Annual	0.0134	H1H	1.6	1.6	18

As shown in Table 11-28, the total 3-hour and annual concentrations of SO_2 are well below their respective screening values. This demonstrates that the proposed project will not have harmful effects on soils and vegetation within the area.

11.5.2 Growth Analysis

The growth analysis includes a projection of the associated industrial, commercial, and residential source growth that will occur in the area due to the proposed source; and an estimate of the air emissions generated by the above associated industrial, commercial, and residential growth. It is projected that most of the employees that will be employed with the Project are currently living within Union and nearby counties. Therefore, the project is expected to result in limited residential growth in the area. In addition, Linden Cogen anticipates negligible commercial or industrial growth in the area attributed to the proposed facility. Note that mobile sources and temporary sources (e.g., construction-related sources) are excluded from consideration as associated sources of growth. Due to the limited industrial, commercial, and residential source growth associated with the project, there is expected to be a negligible increase in emissions related to growth. Therefore, it is anticipated that the air quality impact of the growth associated with the Project will be negligible and will not need to be considered in the air quality modeling analysis required pursuant to the air quality review.

11.5.3 Visibility Analysis

Impacts on visibility resulting due to emissions from the Linden 7 stack have been evaluated with the U.S. EPA model VISCREEN. A visibility analysis was performed for the Liberty Island State Park which is located approximately 16 km east-northeast from the proposed Linden 7 stack. Two parameters are used to determine the acceptability of the visible degradation caused by a plume – (1) the plume perceptibility based on color differences between the plume and viewing background (ΔE) and (2) the plume contrast relative to the sky or terrain background (C). Based on the FLAG workbook, "if a screening analysis of a new or modified source can demonstrate that its emissions will not cause a plume with any hourly estimates of ΔE greater than or equal to 2.0, or the absolute value of the contrast values (|C|) greater than or equal to 0.05, the FLM is likely not to object to the issuance of the PSD permit based on near field visibility impacts and no further near field visibility analysis will be requested." Even though these recommendations are for Class I areas, they are applied to this analysis.

Table 11-29 provides the emission rates that were input into VISCREEN. As discussed previously, the Particulate emissions include secondary $PM_{2.5}$ emissions generated by SO_2 reactions within the plume to ammonia and secondary $PM_{2.5}$ emissions (nitrates and sulfates) generated by reactions to NO_X and SO_2.

TABLE 11-29
VISCREEN EMISSION RATES

Pollutant	Maximum Short-Term (Hourly) Emission Rates[1]
	lb/hr
NO_X	40.40
Particulate	52.67
Primary NO_2	0
Soot	0
Primary SO_4	3.10

1 Steady state operation.

VISCREEN was executed with a background visual range of 40 kilometers and an ozone level of 0.04 ppm which are the VISCREEN recommended values. An average wind speed of 4.51 meters per second and stability of D were also input. The wind speed and stability are the average conditions which occur when the wind is blowing from Linden 7 towards Liberty Island.

Table 11-30 presents the maximum visual impacts inside the Liberty Island area.

TABLE 11-30
VISCREEN SCREENING RESULTS

Background	Theta	Azimuth	Distance	Alpha	Delta E[1]		Contrast[2]	
					Criteria	Plume	Criteria	Plume
	(degrees)	(degrees)	(km)	(degrees)	---	---	---	---
SKY	10	91	16.3	77	4.93	0.15	0.08	0.002
SKY	140	91	16.3	77	2	0.057	0.08	-0.002
TERRAIN	10	84	15.9	84	3.87	0.406	0.08	0.004
TERRAIN	140	84	15.9	84	2	0.056	0.08	0.002

1 Color difference parameter (dimensionless).
2 Visual contrast against background parameter (dimensionless).

The columns title "Criteria" are Screening Values generated by VISCREEN. The columns titled "Plume" are the values within the plume. As shown in Table 11-30, the values of Delta E within the plume are all less than 2. In addition, the absolute Contrast values are all less than .05. Therefore, Linden 7 will not negatively affect the visibility within the Liberty Island area.

11.5.4 Environmental Justice Analysis

The purpose of the environmental justice (EJ) analysis is to evaluate whether minority and low-income communities are affected adversely or disproportionally by the actions of Federal agencies, including approval under the PSD program. The EJ analysis is being submitted under a separate cover.

11.5.5 Endangered Species Impact Evaluation

An Endangered Species Impact Evaluation has been conducted and was provided as Attachment K of the air permit application. It is not anticipated that the Project will adversely impact foraging habitat of the sensitive species identified in the evaluation.

11.6 CLASS I AREA IMPACT ANALYSIS

The closest Class I area to the proposed location of the Project is the Brigantine - Edwin B. Forsythe National Wildlife Refuge located near Atlantic City, New Jersey. This wildlife refuge is approximately 130 kilometers from the Project. Section 3.2.4 demonstrated that the FLAG screening procedures indicates that a Class I area impact analysis for AQRVs is not required. Linden Cogen has received concurrence from both the National Park Service (NPS) Air Resources Division (ARD) and Fish & Wildlife Service (FWS) Air Quality Branch (AQB) that no additional Class I analysis will be necessary (see Attachment A).

FIGURE 1

PROPOSED SITE PLOT PLAN

Ex. 4 CBI

FIGURE 2

AERIAL PHOTOGRAPH

ENVIRONMENTAL PROFESSIONALS
WCM
The WCM Group, Inc.
P. O. Box 3247
Humble, TX 77347-3247
(281) 446-7070 Fax (281) 446-3348

LEGEND

AERIAL PHOTOGRAPH
LINDEN 7
COGEN TECHNOLOGIES LINDEN VENTURE, L.P.
LINDEN, UNION COUNTY, NEW JERSEY

FIGURE 2

DRAWN BY:	LLB
DATE:	05/16/2017
REV. DATE:	
DRAWING ID:	H:\client\EAST\Linden\Linden 7 2017\Figures\Linden 7 aerial.cvx

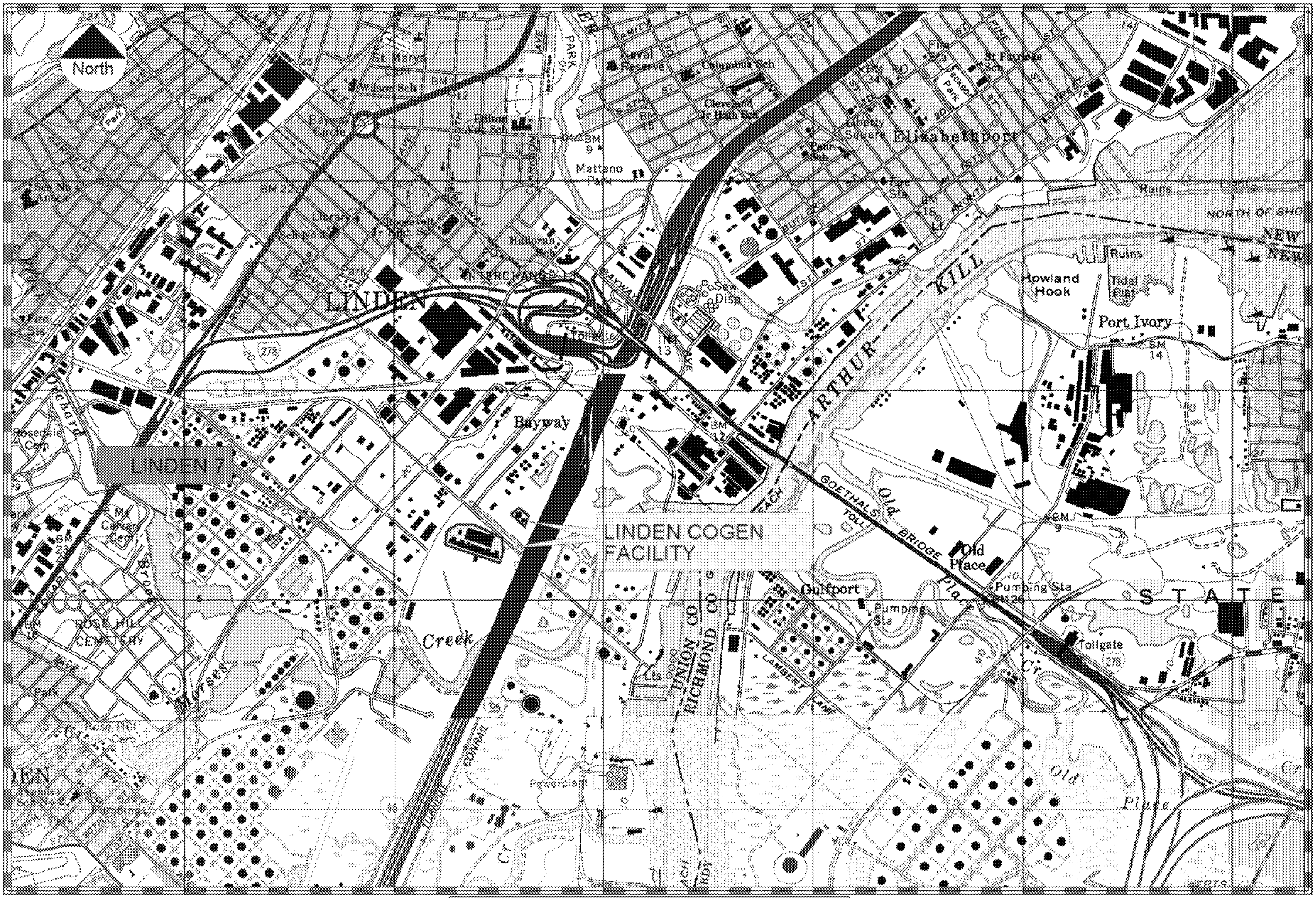
Approximate Scale in Feet
0 196 392 588

N

ED_013256A_00007292-00085

FIGURE 3

SITE LOCATION MAP



Reproduced from USGS 7.5' Topographic Quadrangles: Elizabeth and Arthur Kill, New Jersey; Zone 18

SITE LOCATION MAP

LINDEN 7

COGEN TECHNOLOGIES LINDEN VENTURE, L.P.

LINDEN, UNION COUNTY, NEW JERSEY

1320 0 1320
1:24,000 1" = 2000 feet feet

Drawn By: LLB Date: 03-27-2018

Drawing ID: Y-EAST-LIN7-Figures-Linden 7 topo.geo

FIGURE

3

FIGURE 4

LAND USE AUER MAP

ENVIRONMENTAL PROFESSIONALS

WCM

The WCM Group, Inc.
P. O. Box 3247
Humble, TX 77347-3247
(281) 446-7070 Fax (281) 446-3348

LEGEND

LAND USE AUER MAP
LINDEN 7
COGEN TECHNOLOGIES LINDEN VENTURE, L.P.
LINDEN, UNION COUNTY, NEW JERSEY

FIGURE 4

DRAWN BY:	LLB
DATE:	11/16/2017
REV. DATE:	
DRAWING ID:	H:\client\EAST\Linden\Linden 7 2017\Figures\Linden 7 AUER MOD.cvx

N

ATTACHMENT A

AGENCY CORRESPONDENCE

John Pandolph

From: Salazer, Holly <holly_salazer@nps.gov>
Sent: Friday, July 14, 2017 8:58 AM
To: John Pandolph
Cc: Patricia F Brewer; Don Shepherd; Andrea Stacy; Eleonora.Kats@dep.nj.gov; Bill.kuehne@dep.nj.gov; Kerry Higgins; Thomas Fogarty (tfogarty@starwestgen.com); Fred Reed; Tina Lee (tlee@starwestgen.com); Don Day (dday@starwestgen.com); Jalyn Cummings; Natalie.Sesto@naes.com
Subject: Fwd: Cogen Technologies Linden Venture LP Operating Permit Significant Modification for a PSD affected facility
Attachments: Linden 7 Combined Application.pdf

Mr. Pandolph,

We apologize for the delay in responding to your request for a National Park Service (NPS) review for the Significant Modification to the existing Title V Operating Permit for Cogen Technologies Linden Venture, L.P.

We believe no further Class I analysis will be necessary for this PSD source. However, we would like to clarify a statement made in the application that stated a Class I analysis is not required because there are no Class I areas within 100 km of the Cogen facility. There is no 100 km limit, and a Class I analysis is required for any source that "may affect" a Class I area. Therefore, we appreciate notification for this source, and any future sources, that may have the potential to affect a Class I area.

We would appreciate a copy of the Final Permit and any associated BACT and staff analyses.

Thank you for the opportunity to review your application and we look forward to working with you in the future.

Sincerely,
Holly Salazer

---------- Forwarded message ----------
From: **Brewer, Patricia** <patricia_f_brewer@nps.gov>
Date: Thu, Jul 13, 2017 at 4:20 PM
Subject: Fwd: Cogen Technologies Linden Venture LP Operating Permit Significant Modification for a PSD affected facility
To: "Salazer, Holly" <holly_salazer@nps.gov>, Don Shepherd <Don_Shepherd@nps.gov>

---------- Forwarded message ----------
From: **John Pandolph** <jpandolph@wcmgroup.com>
Date: Thu, Jun 15, 2017 at 10:28 AM
Subject: Cogen Technologies Linden Venture LP Operating Permit Significant Modification for a PSD affected facility
To: "Patricia_F_Brewer@nps.gov" <Patricia_F_Brewer@nps.gov>, "Don_Shepherd@nps.gov" <Don_Shepherd@nps.gov>
Cc: "Eleonora Kats (Eleonora.Kats@dep.nj.gov)" <Eleonora.Kats@dep.nj.gov>, "Natalie Sesto (Natalie.Sesto@NAES.com)" <Natalie.Sesto@naes.com>, "Bill.kuehne@dep.nj.gov" <Bill.kuehne@dep.nj.gov>, Kerry Higgins <khiggins@wcmgroup.com>, "Thomas Fogarty (tfogarty@starwestgen.com)" <tfogarty@starwestgen.com>, Fred Reed <Freed@jlfii.com>, "Tina Lee

(tlee@starwestgen.com)" <tlee@starwestgen.com>, "Don Day (dday@starwestgen.com)" <dday@starwestgen.com>

Ms. Brewer and Mr. Shepherd,

Enclosed is a copy of the Significant Modification to the existing Title V Operating Permit for Cogen Technologies Linden Venture, L.P., New Jersey Program Interest Number: 41809, which is an affected Prevention of Significant Deterioration source. As part of the modeling protocol, included in the application, a Class One (1) Area Impact Analysis was conducted. This information can be found in section 3.2.4 of the modeling protocol, page 125, in the attached pdf of the application.

Please contact me if you have any questions or concerns.

Thanks,

John S. Pandolph

Senior Project Manager III, Technical Services

The WCM Group, Inc.

(281) 446-7070 ext.3451

jpandolph@wcmgroup.com

--
Pat Brewer
NPS Air Resources Division
P.O. Box 25287
Denver, CO 80225-0287
303-969-2153

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____
Holly Salazer
Air Resources Coordinator
Natural Resources Program
Northeast Region
National Park Service

Phone: (814) 865-3100
Fax: (814) 863-7217
Cell: (814) 321-3309

John Pandolph

From: Webster, Jill <jill_webster@fws.gov>
Sent: Friday, June 16, 2017 1:56 PM
To: John Pandolph
Cc: Eleonora Kats (Eleonora.Kats@dep.nj.gov); Natalie Sesto (Natalie.Sesto@NAES.com); William.Kuehne@dep.nj.gov; Kerry Higgins; Thomas Fogarty (tfogarty@starwestgen.com); Fred Reed; Tina Lee (tlee@starwestgen.com); Don Day (dday@starwestgen.com)
Subject: Re: Cogen Technologies Linden Venture LP Operating Permit Significant Modification for a PSD affected facility

Mr. Pandolph,

Thank you for sending the information regarding Cogen Technologies, Linden, New Jersey. Based on the emissions and the distance from the Brigantine Wilderness (as provided in the PSD permit application), the Fish and Wildlife Service anticipates that modeling would not show any significant additional impact to the Class I area. Therefore, we are not requesting that any AQRV analyses be included with the permit application.

We would like to note that the information and conclusion in section 3.1.5 PSD Class 1 Area Impact Analysis is in error. The section states that Class I analyses are only required for areas within 100km of a project subject to PSD review. This is inaccurate; any PSD project can be subject to Class I analyses if the emissions increases and distance from the Class I area warrant such review. Please refer to the Federal Land Manager's Air Quality Related Values Workgroup for more information.

https://www.nature.nps.gov/air/Permits/flag/index.cfm

On Thu, Jun 15, 2017 at 10:12 AM, John Pandolph <jpandolph@wcmgroup.com> wrote:

> Ms. Webster,
>
> Enclosed is a copy of the Significant Modification to the existing Title V Operating Permit for Cogen Technologies Linden Venture, L.P., New Jersey Program Interest Number: 41809, which is an affected Prevention of Significant Deterioration source. As part of the modeling protocol, included in the application, a Class One (1) Area Impact Analysis was conducted. This information can be found in section 3.2.4 of the modeling protocol, page 125, in the attached pdf of the application.
>
> Please contact me if you have any questions or concerns.
>
> Thanks,
>
> John S. Pandolph
>
> Senior Project Manager III, Technical Services
>
> The WCM Group, Inc.

(281) 446-7070 ext.3451

jpandolph@wcmgroup.com

--

Jill Webster, Environmental Scientist
US Fish and Wildlife Service
National Wildlife Refuge System
Branch of Air and Water Resources
7333 W. Jefferson Ave., Suite 375
Lakewood, CO 80235-2017
(303) 914-3804
fax: (303) 969-5444

ATTACHMENT B

POPULATION DATA

Circular Area Profiling System (CAPS)

Version 10C Using Data from Summary File 1, 2010 Census

Ground Zero Coordinates: Latitude=40.631370 , Longitude=74.219592
Linden 7 Tact 5

Access the aggregated data as a csv file here: **caps10c006111.csv**

1.8641-mile radius of specified point (Linden 7 Tact 5)

Subject	Number	Percent
1. Total Population Trends, Etc.		
Universe: Total Population		
Total Population	50,360	
Total Population 2000	47,341	
Change in Population 2000-2010	3,019	6.4
Males	24,177	48.0
Females	26,183	52.0
Population Density	4986	
Land Area Sq. Miles	10	
2. Age		
Universe: Population		
Under 5 Years	3,445	6.8
Age 5 to 9 Years	3,431	6.8
10 to 14 Years	3,500	6.9
15 to 17 Years	2,224	4.4
18 to 19 Years	1,465	2.9
20 to 24 Years	3,425	6.8
25 to 34 Years	7,761	15.4
35 to 44 Years	7,364	14.6
45 to 54 Years	6,887	13.7
55 to 59 Years	2,831	5.6
Age60 to 64 Years	2,374	4.7
65 to 74 Years	2,990	5.9
75 to 84 Years	1,852	3.7
85 Years and Over	811	1.6
Median Age	35.7	
Age 0 to 17	12,600	25.0
18 to 24 Years	4,890	9.7
25 to 44 Years	15,125	30.0

Subject	Number	Percent
45 to 64 Years	12,092	24.0
62 Years and Over	7,018	13.9
65 Years and Over	5,653	11.2
3. Race		
Universe: Population		
One Race	48,005	95.3
White	28,385	56.4
Black or African American	11,433	22.7
American Indian and Alaska Native	331	0.7
Asian	1,056	2.1
Native Hawaiian and Other Pacific Islander	5	0.0
Some Other Race	6,795	13.5
Multi Race - Persons reporting more than one race	2,355	4.7
4. Hispanic or Latino and Race		
Universe: Hispanic or Latino Population		
Hispanic or Latino (of any race)	24,678	49.0
Mexican	NA	
Puerto Rican	NA	
Cuban	NA	
Other Hispanic or Latino	NA	
Not Hispanic or Latino	25,682	51.0
White Alone Not Hispanic	13,290	26.4
5. Relationship of Persons in Households		
Universe: Persons in Households		
Total Persons in Households	49,929	99.1
Householder	17,344	34.4
Spouse	7,140	14.2
Child	16,445	32.7
Own Child Under 18 Years	10,782	21.4
Other Relatives	5,668	11.3
Non Relatives	3,332	6.6
Non-rel Under 18	209	0.4
Non-rel Over 65	133	0.3
Unmarried Partner	NA	
6. Households by Type		
Universe: Households		
Total Households	17,344	

Subject	Number	Percent
Family Households (Families)	12,271	70.8
With Own Children Under 18 Years	6,189	35.7
Married Couple Family	7,140	41.2
With Own Children Under 18 Years	3,499	20.2
Female householder, No Husband Present	3,713	21.4
With Own Children Under 18 Years	2,045	11.8
Non Family Households	5,073	29.2
Unmarried Partner Households	NA	
Same-Sex Unmarried Partner HHs	NA	
Householder Living Alone	4,168	24.0
Householder 65 Years and Over	3,413	19.7
Households With Individuals Under 18 Years	7,058	40.7
7. Group Quarters		
Universe: Population Living in Group Quarters		
Population in Group Quarters	**431**	**0.9**
Institutionalized Population	416	0.8
Pop In Correctional Institutions	0	0.0
Pop in Nursing Homes	416	0.8
Pop in Other Institutions	0	0.0
NonInstitutionalized GQ Pop	15	0.0
College Dormitories (Includes college quarters off	0	0.0
Military Quarters	0	0.0
Other NonInstitutional GQ Pop	15	0.0
8. Housing Occupancy and Tenure		
Universe: Housing Units		
Total Housing Units	**18,694**	
Occupied Housing Units	17,344	92.8
Owner Occupied	6,567	37.9
Renter Occupied	10,777	62.1
Vacant Housing Units	1,350	7.2
Vacant for Rent	599	3.2
Vacant for Sale	240	1.3
Vacant for Seasonal,Recreation or Occasional Use	35	0.2
Homeowner Vacancy Rate	3.53	
Rental Vacancy Rate	5.27	
Pop in Owner-occupied Units	20,471	40.6

Subject	Number	Percent
Pop in Rented Units	29,458	58.5
Average Size of Owner-occupied Units	3.12	
Average Size of Renter-Occupied Units	2.73	

Note: Varibles showing "NA" are not available at the blocks level. Specify tracts as the units to be aggregated to get values for these items.

Summary of True Areas of Circles vs. That of Areas Selected to Estimate Them

(This Report Indicates How Well We Were Able to Approximate the Circular Area)

radius	Estimated	True Area	Ratio of Estimate to True Area
1.86411	11.02	10.92	1.009

Auxiliary Report: Counties Contributing to Circular Areas, By Concentric Ring Areas
Coordinates: (40.631370 , 74.219592)

Outer radius of Ring (or circle)=1.864113636

County Cd	Total Pop
Union NJ	50,359
Richmond NY	1
radius	50,360
	50,360

Access the caps10c application at **http://mcdc.missouri.edu/websas/caps10c.html**

Missouri Census Data Center

ATTACHMENT C

WAIVER REQUEST AND NJDEP APPROVAL

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
CLIMATE AND ENVIRONMENTAL MANAGEMENT
DIVISION OF AIR QUALITY
P.O. Box 420 Mailcode 401-02
TRENTON, NJ 08625-0420
609 - 984 - 1484

PHILIP D. MURPHY
Governor

SHEILA OLIVER
Lt. Governor

CATHERINE R. MCCABE
Acting Commissioner

March 28, 2018

Mr. Michael S. Hunt
The WCM Group, Inc.
110 S. Bender Ave.
Humble, TX 77338

SUBJECT: Cogen Technologies Linden Venture, L.P.
Program Interest # 41809, Permit Activity # BOP170001

Dear Mr. Hunt:

The intent of this letter is to address the pre-construction monitoring requirements pursuant to 40 CFR Part 52.21(m) for the above referenced permit application submitted by Cogen Technologies Linden Venture, L.P. (Linden Cogen).

As background, the Department is reviewing Linden Cogen's Preconstruction and Operating Permit application for a proposed GE7F.05 combustion turbine and unfired heat recovery steam generator system. The project is subject to the Prevention of Significant Deterioration (PSD) Regulations (40 CFR Part 52) because the project's potential annual emission rates of nitrogen oxides and particulate matters (as $PM_{10}/PM_{2.5}$) are greater than the corresponding PSD Significant Emission Rates. Pursuant to 40 CFR Part 52.21(m)(iv), Linden Cogen is required to provide site-specific air quality monitoring data for at least one-year preceding receipt of the application. In a March 14, 2018 letter (attached), Linden Cogen requested a waiver to this site-specific pre-construction monitoring requirement based on the argument that there are representative ambient air quality monitoring data in the vicinity of the facility.

A waiver to the ambient air monitoring requirement cannot be granted solely based on the Significant Monitoring Concentrations (SMC). On January 22, 2013, the U.S. Court of Appeals for the D.C. Circuit vacated and remanded the United States Environmental Protection Agency (EPA) PSD rules regarding Significant Impact Levels (SIL) under 52.21(k)(2) and SMC for fine particulate matter ($PM_{2.5}$). With respect to SMC, the Court precluded EPA from using the $PM_{2.5}$ SMC to exempt permit applicants from the requirement to compile preconstruction monitoring data.

Subsequently, on March 4, 2013, EPA issued a guidance document "Circuit Court Decision on $PM_{2.5}$ Significant Impact Levels and Significant Monitoring Concentration Questions and Answers." This document is meant to address issues that have resulted from the January 22, 2013 court decision. On Page 2, the EPA provides the following guidance on the statutory requirement to compile preconstruction monitoring data:

> Accordingly, all applicants requesting a federal PSD permit, including those having already applied for but have not yet received the permit, should submit ambient $PM_{2.5}$ monitoring data in accordance with the Clean Air Act requirements whenever either direct $PM_{2.5}$ or any $PM_{2.5}$ precursor is emitted in a significant amount. In lieu of applicants setting out $PM_{2.5}$ monitors to collect ambient data, applicants may submit $PM_{2.5}$ ambient data collected from existing monitoring networks when the permitting authority deems such data to be representative of the air quality in the area of concern for the year preceding receipt of the application. We believe that applicants will generally be able to rely on existing representative monitoring data to satisfy the monitoring data requirement.

Although the court's decision related specifically to $PM_{2.5}$, the decision can be interpreted to also preclude the use of SMCs to exempt from monitoring for the other PSD affected pollutants.

Below is a table which lists the selected criteria pollutant background concentrations, for the period of 2014, 2015 and 2016, as measured by the New Jersey Department of Environmental Protection's (NJDEP) monitors, the National Ambient Air Quality Standards (NAAQS), and the locations of the NJDEP air monitoring stations nearest to the Linden Cogen site:

Selected Background Concentrations Based on NJDEP 2014-2016 Monitoring Data

Pollutant	Averaging Time	Background Concentrations (ug/m^3)	NAAQS (ug/m^3)	NJDEP Monitor
CO	1-hour	3,220	40,000	Elizabeth Lab
CO	8-hour	2,070	10,000	Elizabeth Lab
NO_2	1-hour[a]	122.6	188	Elizabeth Lab
NO_2	Annual	41.5	100	Elizabeth Lab
PM_{10}	24-Hour [b]	43	150	Jersey City Firehouse
PM_{10}	Annual	19	50	Jersey City Firehouse
$PM_{2.5}$	24-Hour[c]	24	12	Elizabeth Lab
$PM_{2.5}$	Annual[c]	9.9	35	Elizabeth Lab
SO_2	1-hour[d]	31.4	196	Elizabeth Lab
SO_2	3-hour[b]	55.0	1,300	Elizabeth Lab
SO_2	24-hour[b]	13.1	365	Elizabeth Lab
SO_2	Annual	1.6	80	Elizabeth Lab

a. The 1-hour 3-year average 98th percentile value for NO_2 represents 2014-2016.
b. Represents 2nd highest values measured during the year.
c. The Annual and 24-hour 3-year average 98th percentile for $PM_{2.5}$ represent 2014-2016 values.
d. The 1-hour 3-year average 99th percentile value for SO_2 represents 2014-2016.

The NJDEP has determined that the CO, NO_2, SO_2, PM_{10} and $PM_{2.5}$ monitoring locations in the above table are representative of the existing CO, NO_2, SO_2, PM_{10} and $PM_{2.5}$ ambient concentrations at the Linden Cogen facility. Consequently, since there are representative data, the requirement of collecting one-year site specific pre-construction ambient air quality data is not necessary.

If you have any questions on representative monitoring data, please contact Greg John at (609) 633-1106.

Sincerely,

Sharon Davis

Sharon Davis, Chief
Bureau of Evaluation and Planning

C: Bachir Bouzid
Dave Owen
Eleonora Kats
Joel Leon
Greg John
Yiling Zhang
Annamaria Colecchia, USEPA, Region II

The WCM Group, Inc.

March 14, 2018

Ms. Yiling Zhang
Bureau of Evaluation and Planning
Air Quality Evaluation Section
Mail Code 401-02
401 East State Street, 2nd Floor
Trenton, New Jersey 08625-0420

UPS OVERNIGHT
AIRBILL NUMBER
1Z07479R0195882817

Reference: a. Cogen Technologies Linden Venture, L.P.; Linden, Union County New Jersey; Program Interest Number 41809; Permit Activity Number BOP150002
b. Linden 7 Project: Request to use existing monitoring data in place of pre-construction monitoring

Dear Ms. Zhang:

On behalf of Cogen Technologies Linden Venture, L.P. (Linden Cogen), reference a., The WCM Group, Inc. is submitting this request to allow Linden Cogen to use existing monitoring data in place of pre-construction monitoring.

Linden Cogen operates a cogeneration facility located within the Phillips 66 Bayway Refinery (Refinery) in Linden, Union County, New Jersey. The proposed Linden 7 project (Project) will add one General Electric 7F.05 combustion turbine and unfired heat recovery steam generator on an approximately 3.2-acre plot located within the Refinery in the vicinity of the existing cogeneration facility. The Project will be a significant modification of the existing Linden Cogen cogeneration facility. Since the Project, as a major modification, will potentially emit more than the Significant Emission Rates of NO_X, TSP, $PM_{2.5}$, PM_{10}, ozone, and sulfuric acid, it is subject to Prevention of Significant Deterioration (PSD) permitting. Also, since the Project is to be located in an area designated as nonattainment for ozone, Nonattainment New Source Review (NNSR) requirements apply. Pre-construction monitoring is required for each pollutant that the Project has the potential to emit in a significant amount pursuant to 40 CFR 52.21(m)(b). However, according to 40 CFR 52.21(i)(5) a modification may be exempted from pre-construction monitoring if the emission increase of the pollutant would cause air quality impacts less than a Significant Monitoring Concentration (SMC). SMCs are listed in Table 1.

Table 1
Significant Monitoring Concentrations

Air Pollutant	Averaging Time	SMC ($\mu g/m^3$)	SIL ($\mu g/m^3$)	Predicted Maximum Impact ($\mu g/m^3$)
NO_2	1-Hour	---	7.5	7.29
	Annual	14	1	0.096
CO	1-Hour	---	2,000	179
	8-Hour	575	500	132
SO_2	1-Hour	---	7.8	0.670
	3-Hour	---	25	0.614
	24-Hour	13	5	0.257
	Annual	---	1	0.0134
PM_{10}	24-Hour	10	5	2.63
$PM_{2.5}$	24-Hour	---	1.2	1.03
	Annual	---	0.3	0.0686

Table 1 also lists Significant Impact Levels (SILs). If predicted maximum impacts due to the emissions from a source are less than the respective SIL, the source is considered an insignificant source. As shown in Table 1, not every compound/averaging period has an SMC. For those compound/averaging periods that do have an SMC, the SMC is always greater than the SIL. Lastly, Table 1 also lists the maximum predicted impact of each compound due to emissions associated with the Project. As shown in Table 1, the maximum predicted impact of each compound is less than its respective SMC and SIL.

In order to show compliance with the National Ambient Air Quality Standards for the criteria pollutants (NO_2, CO, SO_2, $PM_{2.5}$, and PM_{10}) pursuant to NJDEP requirements, the background concentration of each compound is added to the maximum modeled impact. The background concentration is derived from nearby ambient air monitors. Background concentrations of NO_2, CO, SO_2, and $PM_{2.5}$ were measured at a nearby monitor, EPA ID No. 34-039-0004. This monitor is located slightly less than 1.5 kilometers northeast from the proposed Linden 7 stack. The background PM_{10} concentration was measured at EPA ID No 34-017-1003. This monitor is located approximately 17.5 kilometers northeast from the proposed Linden 7 stack.

Since the maximum predicted impact of each compound/averaging period resulting due to emissions associated with the Project are less than their respective SMC/SIL and nearby monitors exist from which background concentrations may be obtained, Linden Cogen respectfully requests that existing monitoring data be used in place of pre-construction monitoring.

Thank you for your consideration in this matter. Please contact me at (281) 446-7070 or mhunt@wcmgroup.com if you have any questions or require any additional information.

Sincerely,

for Michael S. Hunt
Special Consultant, Technical Services

MSH/kkc
1521025947.ltr.docx

cc: N. Sesto (electronic)
B. Durham (electronic)

ATTACHMENT D

RECEPTOR GRIDS

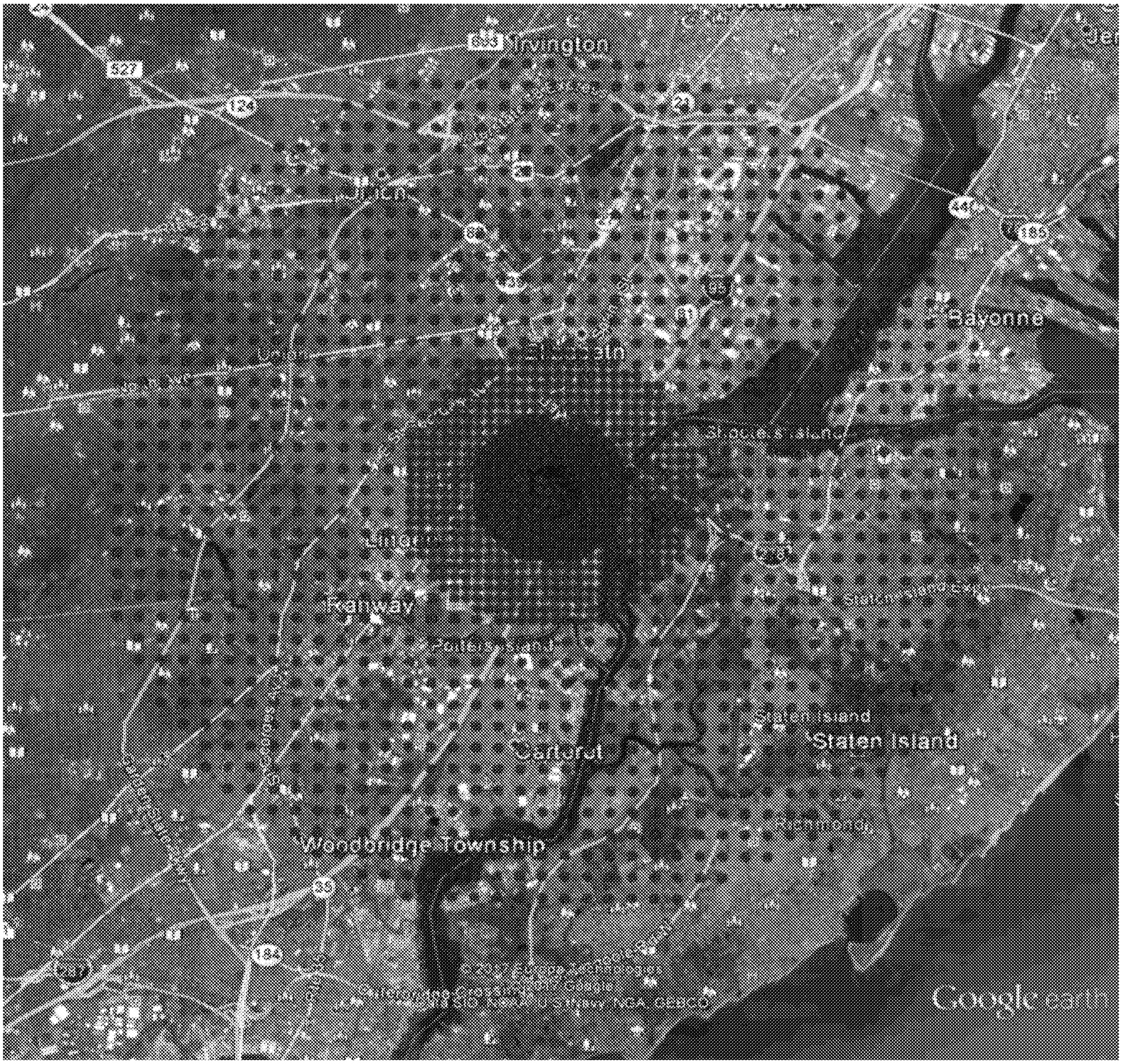

Figure D-1. Coarse (500-meter spacing) Receptor Grid

ED_013256A_00007292-00110

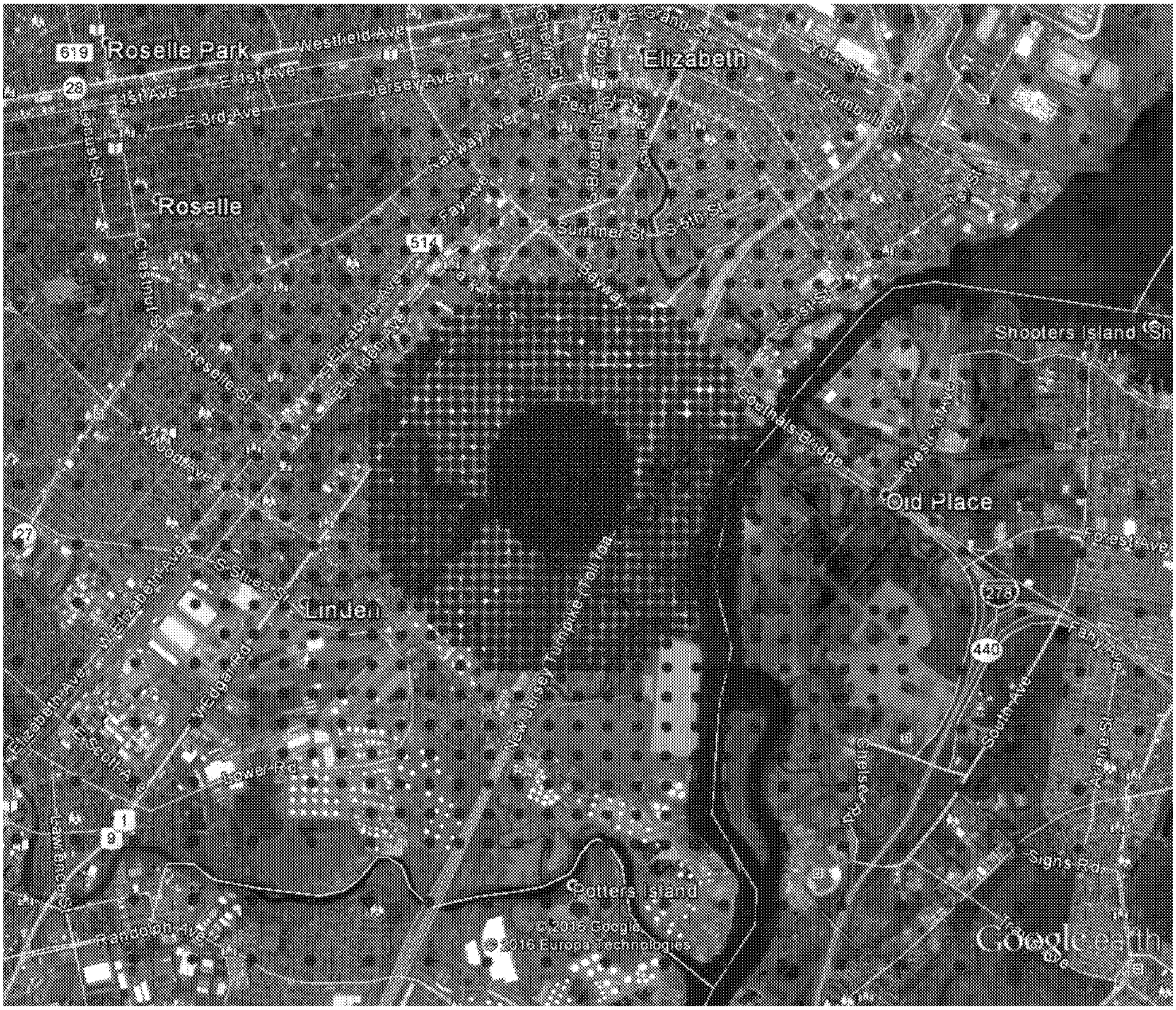

Figure D-2. Medium (250-meter spacing) Receptor Grid

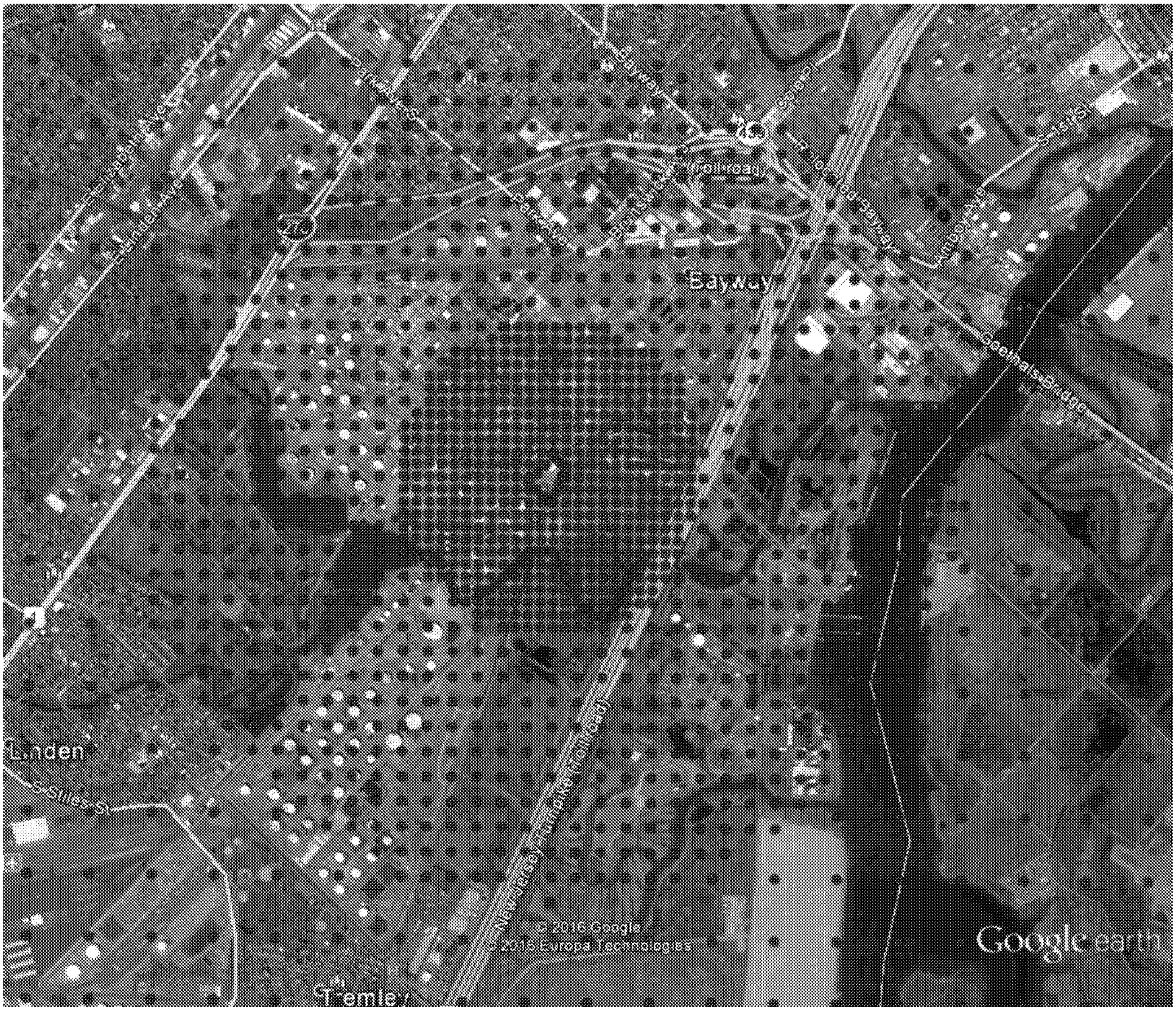

Figure D-3. Fine (100-meter spacing) Receptor Grid

Figure D-4. Close-In (50-meter spacing) Receptor Grid

ATTACHMENT E

NESCAUM COMMENTS ON DRAFT GUIDANCE

FOR $PM_{2.5}$ PERMIT MODELING

NESCAUM
www.nescaum.org

Northeast States for Coordinated Air Use Management
89 South Street, Suite 602 Boston, MA 02111
Phone 617-259-2000 Fax 617-742-9162
Arthur N. Marin, Executive Director

May 30, 2013

George Bridgers
Air Quality Modeling Group
U.S. Environmental Protection Agency
Mailcode: C439-01
109 T.W. Alexander Drive
Research Triangle Park, NC 27709

Re: *Draft Guidance for $PM_{2.5}$ Permit Modeling*

Dear Mr. Bridgers:

The Northeast States for Coordinated Air Use Management (NESCAUM) offers the following comments on the *Draft Guidance for $PM_{2.5}$ Permit Modeling* ("Draft Guidance") that was released by the U.S. Environmental Protection Agency (EPA) for public review on March 4, 2013. NESCAUM is the regional association of air pollution control agencies representing Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont.

NESCAUM thanks the EPA for its efforts in developing this Draft Guidance and encourages the EPA to release its Final Guidance at the earliest practicable date after incorporating stakeholder comments. NESCAUM also encourages the EPA to propose an amendment to the Guideline on Air Quality Modeling (40 CFR Part 51 Appendix W) referencing the Final Guidance to provide clear and consistent requirements for permitting authorities and applicants.

Introduction

Stationary sources that seek a Prevention of Significant Deterioration (PSD) permit must submit an application to the appropriate permitting authority. The application must demonstrate that violations of the national ambient air quality standards (NAAQS) for particulate matter with aerodynamic diameter less than 2.5 micrometers ($PM_{2.5}$) will not occur as a result of the construction and operation of the source. As such, state permitting authorities and permit modelers must have clarity about what is required to successfully demonstrate that $PM_{2.5}$ emissions for new projects will not pose health risks to surrounding areas.

The release of the Draft Guidance is a step toward fulfilling the EPA's pledge to supply states with additional recommendations for modeling analysis of $PM_{2.5}$ compliance demonstrations, especially with regard to secondary formation of $PM_{2.5}$, as described in the memorandum by Stephen Page dated March 23, 2010. The Draft Guidance also conforms with the EPA's commitment to evaluate updates to the EPA's *Guideline on Air Quality Models*, Appendix W of 40 CFR 51 to incorporate new analytical techniques or models for ozone and secondary $PM_{2.5}$ as appropriate, consistent with the EPA's January 4, 2012 grant of a petition for rulemaking on behalf of the Sierra Club. The EPA solicited feedback on its development of the Draft Guidance at multiple public forums, including the EPA's 10th Modeling Conference in March 2012.

NESCAUM offers eight comments in response to the assessment methods described in the Draft Guidance, the process for selecting the assessment method, and the thresholds at which the methods are applicable. Our comments also address the modeling for $PM_{2.5}$ increments, as described in Section V of the Draft Guidance.

1. Revising Precursor Emission Thresholds in the Assessment Cases

Background: In its Draft Guidance, the EPA describes four "assessment cases" that define what air quality analyses (if any) an applicant would need to conduct to demonstrate compliance with the $PM_{2.5}$ NAAQS. These are outlined in Table II-1 on page 18 of the Draft Guidance, and describe the four scenarios in which direct emissions of $PM_{2.5}$ are above or below a Significant Emission Rate (SER) of 10 tons per year (tpy) and emissions of nitrogen oxides (NOx) or sulfur dioxide (SO_2) (which are precursors to secondary $PM_{2.5}$ formation) are above the SER of 40 tpy. Cases 3 and 4 describe the situation in which emissions of either NOx or SO_2 precursor species are above the SER of 40 tpy.

Comment: Based on photochemical modeling experience within the NESCAUM states, the near-source secondary $PM_{2.5}$ impacts from sources with limited $PM_{2.5}$ precursor emissions (e.g., 100 tpy or less) is very low. NESCAUM recommends that the EPA perform photochemical modeling to develop emissions thresholds that more accurately reflect the emission levels at which precursor emissions may be important for near-source impacts. NESCAUM further encourages the EPA to work with the states to develop state-specific or region-specific analyses that will indicate the importance of local conditions to the formation of secondary $PM_{2.5}$ and possibly set state- or region-specific thresholds based on these analyses.

2. Section III.2.1 Qualitative Assessment

Background: The first approach for assessing the impacts of precursor emissions on secondary $PM_{2.5}$ formation that the EPA suggests in its Draft Guidance is a qualitative analysis. Section III.2.1 of the Draft Guidance provides information about the qualitative assessment process, both when it is to be selected and how it is to be performed.

In introducing the qualitative assessment, the EPA states the following:

> In a number of NAAQS compliance demonstrations requiring an assessment of the impact from secondary $PM_{2.5}$ formation, it is anticipated that a holistic qualitative analysis of the new or modifying emissions source and the atmospheric environment in which the emissions source is to be located will suffice for determining that secondary $PM_{2.5}$ impacts associated with the source's precursor emissions will not cause or contribute to a violation of the 24-hour or annual $PM_{2.5}$ NAAQS (p.25, lines 13-18).

The EPA indicates that a modeling protocol should include a detailed conceptual description of the background air pollution concentrations and of the nature of the emissions sources surrounding the new or modifying emissions source. The conceptual description is to be comprised of the following types of information:

- current $PM_{2.5}$ concentrations in the surrounding region;
- current NAAQS-form relevant design values for $PM_{2.5}$;
- seasonality in $PM_{2.5}$ concentrations;
- speciated composition of current $PM_{2.5}$ levels;
- long term trends;
- background concentrations of precursor species, including ammonia, volatile organic compounds (VOCs), and ozone;
- mitigating factors such as low ammonia levels that could limit secondary formation;
- regionally representative meteorological conditions associated with time periods of higher and lower ambient 24-hour average $PM_{2.5}$ concentrations, including temperature inversions, stagnant high pressure systems, etc.;
- a description of how any meteorological factors could limit or enhance the formation of secondary $PM_{2.5}$ from precursor emissions; and
- an analysis of existing photochemical grid modeling in the context of understanding the general response of secondary $PM_{2.5}$ formation to significant changes in regional precursor emissions.

Finally, the qualitative assessment described in the Draft Guidance also includes a narrative description of how the secondary $PM_{2.5}$ formation resulting from precursor emissions could contribute to existing regional $PM_{2.5}$ levels.

<u>Comment:</u> Based on the range of scenarios in which this guidance will be applied, NESCAUM requests that the EPA consider the qualitative assessment as one option that may be applied in a weight-of-evidence type of analysis. For areas in which a qualitative analysis will suffice, results from the assessment technique presented in the EPA's Draft Guidance may offer meaningful insight about the proposed source.

If finalized, this qualitative approach would become an initial approach selected for demonstration that significant precursor emissions would not lead to violations of the $PM_{2.5}$ NAAQS. While NESCAUM supports having a qualitative assessment as one option for a weight-of-evidence type of analysis, NESCAUM raises the following two concerns about the EPA's proposal:

(1) **There is no clear threshold for passing the qualitative analysis.** Rather, the approval or denial of the permit application hinges on the professional judgment of its reviewer. While we have great confidence in the competence of permit review officials, relying on

their professional judgment does not lead to a clear, reliably reproducible outcome for the permit review process, and may lead to significant differences in permit application processes in different regions.

(2) **The process is open to potential for abuse.** Because the qualitative assessment is open to interpretation, it provides an opportunity for unintentional or intentional misinterpretation of the facts.

As such, NESCAUM requests that the EPA develop clear guidelines describing when the qualitative assessment is appropriate, or when other, numerical approaches may be warranted to support a weight-of-evidence approach. NESCAUM requests that the EPA develop an optional numerical approach to be used in place of or in addition to the described qualitative approach when necessary to complete a weight-of-evidence approach. Comment 3 of this document describes NESCAUM's suggestion for such a conservative, numerical, screening assessment for use in a weight-of-evidence approach.

By proposing this qualitative assessment approach and indicating that the EPA expects that this approach will suffice for most sources, the EPA appears to be indicating that near-source secondary formation is not important. If it is the opinion of the EPA that near-source secondary $PM_{2.5}$ formation is not important, the EPA should state that.

3. Optional Numerical Screening Approach

Comment: Based on the discussion in Comment 2 above, NESCAUM is suggesting a numerical approach as an option for supporting a weight-of-evidence analysis.

The weight-of-evidence approach for the evaluation of secondary formation of $PM_{2.5}$ should include the option of using worst-case SO_2 to sulfate and nitrogen dioxide (NO_2) to nitrate conversion rates. One set of worst-case conversion values could be designated for modeling 24-hour $PM_{2.5}$ impacts and another for annual $PM_{2.5}$ modeling. Use of these worst-case conversion factors would be limited to all receptors in the near-field for determination of significant impact levels (SILs) and PSD increment/NAAQS compliance, but not long-range transport modeling (greater than 50 km).

Based on our initial review of available literature, a 9 percent per hour conversion rate represents a typical worst-case short-term conversion rate of SO_2 to sulfate (summertime mid- to late afternoon); and 8 percent represents a typical worst-case short-term conversion rate of NO_2 to nitrate (daytime winter).[1]

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[1] *See* Luria M, Imhoff RE, Valente RJ, Parkhurst WJ, Tanner RL, "Rates of Conversion of Sulfur Dioxide to Sulfate in a Scrubbed Power Plant Plume," *Journal of the Air & Waste Management Association*, 51 (2001), 1408-1413; Conners J, Heinold D, Paine R, Moore G, "Screening Approach to Account for Secondary $PM_{2.5}$ in Stationary Source Modeling," (paper presented at the Guideline on Air Quality Models: The Path Forward, Air & Waste Management Association meeting, Raleigh, North Carolina, March 2013); Eatough DJ, Caka FM, Farber RJ, "The

Because the $PM_{2.5}$ impact will be modeled for a 24-hour period rather than a one-hour period, the one-hour worst-case conversion rates listed above can be reduced to reflect the lower conversion rates that occur the remainder of the 24-hour period. Use of a 7 percent per hour SO_2 to sulfate conversion rate and a 5 percent per hour NO_2 to nitrate conversion rate would still represent very conservative assumptions when modeling the contribution of secondary particulates to the 24-hour $PM_{2.5}$ concentration.

From these short-term conversion rates, annual average worst-case per-hour conversion rates can be derived. Three percent per hour represents a reasonable worst-case **annual** conversion rate of SO_2 to sulfate, and 2.5 percent per hour represents a reasonable worst-case **annual** conversion rate of NO_2 to nitrate.

The simplest method of incorporating these conversion rates into the modeling would be to multiply the designated worst-case conversion rates by the hourly and annual emission rates of SO_2 and NOx in units of pounds per hour or tons per year, respectively.

These worst case secondary $PM_{2.5}$ formation values must be adjusted further before combining with the direct $PM_{2.5}$ emission rate.

- Apply the ambient ratio method (ARM) Tier 2 nitric oxide (NO) to NO_2 conversion rate to the NOx emission rate. For the 24-hour $PM_{2.5}$ modeling, the NOx hourly emission rate (pounds per hour) should be multiplied by 0.8. For the annual $PM_{2.5}$ modeling, the NOx annual emission rate (tons per year) should be multiplied by 0.75.

- Because SO_2 and NO_2 will be transformed in the atmosphere to heavier molecules, the SO_2 and NO_2 mass emission rate must be adjusted to reflect the molecular weight (MW) of ammonium sulfate $(NH_4)_2SO_4$ and ammonium nitrate NH_4NO_3. The calculation of the adjustment factors are presented below.

$$(NH_4)_2SO_4 \text{ (lb/hr)} = SO_2 \text{ (lb/hr)} \cdot (MW_{(NH_4)_2SO_4}/MW_{SO_2})$$

$$(NH_4)_2SO_4 \text{ (lb/hr)} = SO_2 \text{ (lb/hr)} \cdot (132/64)$$

$$(NH_4)_2SO_4 \text{ (lb/hr)} = SO_2 \text{ (lb/hr)} \cdot 2.06$$

$$NH_4NO_3 \text{ (lb/hr)} = NO_2 \text{ (lb/hr)} \cdot (MW_{NH_4NO_3}/MW_{NO_2})$$

$$NH_4NO_3 \text{ (lb/hr)} = NO_2 \text{ (lb/hr)} \cdot (80/46)$$

$$NH_4NO_3 \text{ (lb/hr)} = NO_2 \text{ (lb/hr)} \cdot 1.74$$

Conversion of SO_2 to Sulfate in the Atmosphere," *Israel Journal of Chemistry*, 34 (1994), 301-314; Zak BD, "Lagrangian Measurements of Sulfur Dioxide to Sulfate Conversion Rates," *Atmospheric Environment*, 15 (1981), No. 12, 2583-2591.

For example, if a source had 100 tpy (22.8 lb/hr) of both SO_2 and NOx, the calculation would be as follows:

Secondary $PM_{2.5}$ from SO_2 = 22.8 lb $PM_{2.5}$/hr · 0.07 · 2.06 = 3.3 lb/hr

Secondary $PM_{2.5}$ from SO_2 = 100 tons $PM_{2.5}$/yr · 0.03 · 2.06 = 6.2 tons/yr

Secondary $PM_{2.5}$ from NO_X = 22.8 lb $PM_{2.5}$/hr · 0.05 · 0.8 · 1.74 = 1.6 lb/hr

Secondary $PM_{2.5}$ from NO_X = 100 tons $PM_{2.5}$/yr · 0.025 · 0.75 · 1.74 = 3.3 tons/yr

Therefore, the direct $PM_{2.5}$ emission rate would be increased by 4.9 lb/hr (3.3 lb/hr + 1.6 lb/hr) when modeling 24-hour $PM_{2.5}$ impacts. The direct $PM_{2.5}$ emission rate would be increased by 9.5 tpy (2.2 lb/hr) when modeling annual $PM_{2.5}$ impacts.

Possible refinements to this screening assessment would be to designate SO_2 and NO_2 conversion rates by region of the country (Northeast, South, Midwest, and West) and/or by season, and/or by daytime and night.

We believe adding this method as an option in support of a top-level weight-of-evidence assessment would provide a conservative, definitive, and defensible value of the estimated contribution of secondary particulates. Many sources, especially the smaller sources of SO_2 and NOx, would be able to apply this method and show no adverse $PM_{2.5}$ impact.

4. Appendix C: Example of a Qualitative Assessment of the Potential for Secondary $PM_{2.5}$ Formation

Background: In Appendix C of the Draft Guidance, the EPA provides an example of a qualitative assessment of the potential for secondary $PM_{2.5}$ formation. Unfortunately, this example is for an oil and gas exploration drill ship and support fleet over open water on the Chukchi Sea in the Arctic Ocean, a source type and a location environment having little in common with the continental United States.

Comment: NESCAUM requests additional examples of the qualitative assessment for urban and rural areas in the eastern and western continental United States.

5. Clarity Needed in Selecting the Required Assessment Type

Background: The hybrid qualitative/quantitative assessment (described in section III.2.2 of the Draft Guidance) is intended by the EPA to provide further information when the proposed qualitative assessment will not suffice. When introducing the topic, the EPA states that "it may not always be possible to provide such a justification [based on the proposed qualitative assessment] without some quantification of the potential secondary $PM_{2.5}$ impacts from the proposed new or modifying source's precursor emissions" (page 29, lines 16-18). However, there is no discussion indicating when such a situation would occur.

Comment: NESCAUM requests that the Final Guidance clearly indicate what the thresholds for passing the top-tier and mid-tier analyses are. Without a clear, reproducible methodology for decisions regarding permit modeling demonstrations for secondary $PM_{2.5}$, the states may be vulnerable to lawsuit by permit applicants and third-parties.

6. Section III.2.3 Full Quantitative Photochemical Grid Modeling

Comment: There will be significant logistical and technical difficulties in any attempts to adapt the regional photochemical grid models to individual source permit applications. The use of such models for performing regional ozone and $PM_{2.5}$ state implementation plan (SIP) modeling is not readily transferable to PSD permit scale modeling without a significant set of revisions to the process and platforms used for the SIP-level modeling. Based on the NESCAUM states' expertise in performing such assessments using CMAQ and CAMx, there are several technical issues that make the application of these modeling systems to PSD permitting challenging.

- Sub-models within photochemical grid, meteorological, and emissions modeling systems require very intensive data processing. For example, in simulating the chemical interactions and transformations of precursors to secondary $PM_{2.5}$, it is essential to include an inventory of significant sources, not just the source under scrutiny. Further, most models included in the regional modeling platforms require significant computer and operating system resources that states typically reserve for SIP attainment modeling but more intensive than what most state permitting staff typically use for assessment of individual sources.
- Inventories currently in use for SIP level modeling may not be appropriate for permit modeling due to the inventory "age"—the 2007 inventory is currently the generally accepted base year for analysis—and the fact that these inventories have not been fully scrutinized or evaluated for use in $PM_{2.5}$ evaluations—they were developed primarily for ozone planning. Evidence from some evaluations that have been performed[2] indicates that CMAQ generally overpredicts $PM_{2.5}$ concentrations. Additional work is necessary to fully diagnose and resolve these issues. One such evaluation by New York indicates that CMAQ overestimates $PM_{2.5}$ concentrations and certain species. Further work is necessary to understand the reasons. Thus, more detailed, longer-term evaluations must be carried out, and not just "sample period" evaluations.
- Meteorological data for input into the CMAQ and CAMx systems require detailed processing and may not accurately reflect the small scale weather conditions in the near-field of the emissions source. Such processing has been confined in the past to a sample period or at most a season (e.g., ozone season). Any extension of the modeling to a set of years of meteorological data will involve a large effort not only in the processing, but in revisiting the scale of the grids used. Most of the SIP modeling for the NESCAUM region to date has relied upon, at best, a 12 km scale grid, which is occasionally overlaid with a nested 4 km grid in the areas of interest. In some instances, such as complex

[2] *See* NYSDEC 2012. Preliminary Evaluation of the 2007 CMAQ Level 3 12 km base case: $PM_{2.5}$ Mass and Speciation. NYSDEC document prepared for OTC discussions, dated December, 2012.

terrain setting, this latter grid might not be adequate either and a further refinement would be necessary. This added effort points to the need to start with a revised modeling platform, which will be resource-intensive. To run the WRF meteorological processing for one year's worth of data at the more refined grid scale would take about two months of runtime alone and will demand the same level of computational resources for generating the concentration fields.

All this work assumes that permitting staff at the state agencies and the EPA regional offices have the expertise and resources to review and/or perform independent verification of the photochemical model applications. Such expertise and the large computer resources (e.g., server clusters) at the states and regional offices are usually reserved for SIP level ozone modeling. The development of a comprehensive platform for $PM_{2.5}$ CMAQ modeling purposes has been estimated to exceed a million dollars in resources.

NESCAUM is concerned that state staff charged with evaluating permit applications may not have the capacity to review in detail the permit applications that contain results from photochemical grid models such as CMAQ and CAMx. Most permit modeling staff are very familiar with the dispersion modeling systems AERMOD and CALPUFF, and are very comfortable with reviewing permit modeling exercises that involve the use of those models. Expanding the use of CMAQ and/or CAMx to permit modeling will place a heavy burden on permit modeling staff, and may potentially result in inadequate review of permit applications that include results derived from photochemical modeling. Furthermore, photochemical grid modeling would require heavy financial investments from permit applicants and regulated sources.

Recommendations in the EPA's Guidance for performing photochemical grid modeling using CMAQ and CAMx must take these technical, logistical, and resource constraints into account.

NESCAUM suggests that the EPA support regional efforts to develop region-specific base inventories to serve as a basis for source-specific photochemical modeling analyses. This approach is a practical one for incorporating the contribution of secondary $PM_{2.5}$ from individual point sources in the permitting process when such detailed assessment is warranted. This approach will also allow the determination of the emission rates of the precursors that could trigger impacts over levels of significance as well as the downwind distances from a proposed source at which secondary formation becomes important enough for consideration of permitting conditions. Pending the availability of the results from this modeling platform, the agencies should be allowed to rely on less complex numerical approaches for the assessment of the secondary $PM_{2.5}$ contributions to total $PM_{2.5}$ impacts in permit application reviews, as described in Comments 3 and 7 in this document.

In summary, NESCAUM requests that the EPA limit the use of photochemical modeling to only the most in-depth analyses, exclude it from the hybrid modeling approach entirely, and encourage and facilitate the development of regional-level modeling efforts to serve as a basis for source-specific evaluations.

7. Use of the CALPUFF Model

Background: In the past, the EPA has approved of state personnel using the CALPUFF system at greater distances at which secondary pollutant formation becomes significant. In comparison to CMAQ, CALPUFF is designed for runtime efficiency in single source modeling. In addition, it will properly simulate interactive source modeling for PSD analysis. In modeling secondary $PM_{2.5}$ formation at greater distances, multiple years of analysis will be essential because inter-annual variability is more significant at these distances. It will be much more time and resource-effective to rely on CALPUFF than CMAQ for this purpose.

Comment: The Hybrid Qualitative/Quantitative Assessment should include a less subjective option than the proposed mix of the simplistic qualitative assessment and the use of the results from the highly complex regional photochemical SIP models. Somewhere within the final tiered modeling options that the EPA recommends in the Final Guidance should be a method of quantifying impacts of secondary $PM_{2.5}$ that is short of reliance on a photochemical model, but properly simulates the transport scenario and chemistry for PSD/interactive source modeling. This method should be valid beyond 50 km since secondary $PM_{2.5}$ formation can become significant at greater distances. A viable objective assessment of less complexity than using a photochemical grid model (e.g., CMAQ) would be the CALPUFF model, version 6.42, with the new ISORROPIA (version 2.1) chemistry algorithm for the source in question. The chemistry algorithm in CALPUFF version 6.42 has been found to be both more accurate and superior to that in the EPA's currently approved version of CALPUFF version 5.8.[3]

Another advantage of adopting CALPUFF version 6.42 as an option for estimating secondary $PM_{2.5}$ is that it would also improve model estimates of Class I Air Quality Related Values impacts and Class I increment consumption.

NESCAUM suggests that the EPA investigate the possible use of CALPUFF in single source mode (i.e., modeling the proposed source only) versus multiple source mode to determine the simplest creditable methods for evaluation of secondary particulate formation at greater distances when necessary. In addition, NESCAUM recommends that the EPA compare the results from CALPUFF and CMAQ analyses for the development of a hierarchy of viable modeling methods when screening methods fail.

8. Clarification of PSD Baseline Dates for Areas Redesignated to Attainment

Background: This section discusses the modeling of the $PM_{2.5}$ increments and the three important dates for setting the baseline: major source baseline date, trigger date, and the minor source baseline date. The 2010 PSD $PM_{2.5}$ Final Rule specified that the major source baseline date will be October 20, 2010 and the trigger date will be October 20, 2011.

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[3] *See* Scire JS, Strimaitis DG, Wu Z-X, "New Developments and Evaluations of the CALPUFF Model," presented at the 10th Conference of Air Quality Models, RTP, North Carolina, March 2012; Karamchandani P, Chen S-Y, Balmori R, "Evaluation of Original and Improved Versions of CALPUFF Using the 1995 SWWYTAF Data Base, AER Technical Report," prepared for API, Washington, DC, October 2009.

Comment: Some areas in the NESCAUM region were designated nonattainment for $PM_{2.5}$ when the major source baseline date (October 20, 2010) and the trigger date (October 20, 2011) occurred, but have since been redesignated to attainment for $PM_{2.5}$ after these dates. The Final Guidance should address the timeline for areas that were redesignated to nonattainment for $PM_{2.5}$ after the baseline and trigger dates discussed above.

Summary

The NESCAUM states will be implementing their programs with input from the EPA Guidance, and therefore we have a significant stake in ensuring that the Final Guidance reflects the best practices for permit modeling for $PM_{2.5}$. We look forward to working with the EPA so that the Final Guidance incorporates these practical ideas to streamline and improve the process of modeling in support of the permitting process to address secondary $PM_{2.5}$.

If you or your staff have any questions regarding the issues raised in these comments, please contact Leiran Biton of NESCAUM at 617-259-2027.

Sincerely,

Arthur N. Marin
Executive Director

cc: NESCAUM Directors
Dave Conroy, EPA Region 1
Donald Dahl, EPA Region 1
Brian Hennessey, EPA Region 1
Brendan McCahill, EPA Region 1
Ida McDonnell, EPA Region 1
John Filippelli, EPA Region 2
Anna Maria Coulter, EPA Region 2

ATTACHMENT F

CD-ROM WITH MODELING FILES

ATTACHMENT G

TABLE OF CONTENTS FOR CD-ROM

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Subdirectory	File Name	Description
AERSURFACE	Linden1992_NLCD.tif	Land cover data
	Linden7AERSURFACE.dat	AERSURFACE input file
	Linden7AERSURFACE.out	AERSURFACE output file
	Linden7AERSURFACE.txt	AERSURFACE generated file
	Linden7albedo_bowen_domain.txt	AERSURFACE generated file
	Linden7roughness_domain.txt	AERSURFACE generated file
	Linden7tiff_debug.txt	AERSURFACE generated file
AERMAP	AERMAP.INP	AERMAP input file
	aermap.out	AERMAP output file
	MAPDETAIL.OUT	AERMAP generated output file
	MAPPARAMS.OUT	AERMAP generated output file
	L7_NED_1ArcSecond.tif	Elevation Data used in AERMAP
	L7RecepElev.OUT	AERMAP generated receptor elevations
UnitEmissionSS	Linden7_2010_UnitER.inp	AERMOD input file for 2010 with unit emission rates for steady state conditions
	Linden7_2010_UnitER.out	AERMOD output file for 2010 with unit emission rates for steady state conditions
	Linden7_2010_L7NG100L_UnitER_1Hr.GRF	AERMOD generated plot file for 2010 1-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
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	Linden7_2010_L7DO50L_UnitER_AN.GRF	AERMOD generated plot file for 2010 annual impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2010_L7DO100M_UnitER_1Hr.GRF	AERMOD generated plot file for 2010 1-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2010_L7DO100M_UnitER_3Hr.GRF	AERMOD generated plot file for 2010 3-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2010_L7DO100M_UnitER_8Hr.GRF	AERMOD generated plot file for 2010 8-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2010_L7DO100M_UnitER_24Hr.GRF	AERMOD generated plot file for 2010 24-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2010_L7DO100M_UnitER_AN.GRF	AERMOD generated plot file for 2010 annual impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2010_L7DO75M_UnitER_1Hr.GRF	AERMOD generated plot file for 2010 1-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2010_L7DO75M_UnitER_3Hr.GRF	AERMOD generated plot file for 2010 3-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2010_L7DO75M_UnitER_8Hr.GRF	AERMOD generated plot file for 2010 8-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2010_L7DO75M_UnitER_24Hr.GRF	AERMOD generated plot file for 2010 24-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2010_L7DO75M_UnitER_AN.GRF	AERMOD generated plot file for 2010 annual impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures

Subdirectory	File Name	Description
	Linden7_2010_L7DO50M_UnitER_1Hr.GRF	AERMOD generated plot file for 2010 1-hour impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2010_L7DO50M_UnitER_3Hr.GRF	AERMOD generated plot file for 2010 3-hour impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2010_L7DO50M_UnitER_8Hr.GRF	AERMOD generated plot file for 2010 8-hour impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2010_L7DO50M_UnitER_24Hr.GRF	AERMOD generated plot file for 2010 24-hour impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2010_L7DO50M_UnitER_AN.GRF	AERMOD generated plot file for 2010 annual impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2010_L7DO100H_UnitER_1Hr.GRF	AERMOD generated plot file for 2010 1-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2010_L7DO100H_UnitER_3Hr.GRF	AERMOD generated plot file for 2010 3-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2010_L7DO100H_UnitER_8Hr.GRF	AERMOD generated plot file for 2010 8-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2010_L7DO100H_UnitER_24Hr.GRF	AERMOD generated plot file for 2010 24-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2010_L7DO100H_UnitER_AN.GRF	AERMOD generated plot file for 2010 annual impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2010_L7DO75H_UnitER_1Hr.GRF	AERMOD generated plot file for 2010 1-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2010_L7DO75H_UnitER_3Hr.GRF	AERMOD generated plot file for 2010 3-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2010_L7DO75H_UnitER_8Hr.GRF	AERMOD generated plot file for 2010 8-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures

Subdirectory	File Name	Description
	Linden7_2010_L7DO75H_UnitER_24Hr.GRF	AERMOD generated plot file for 2010 24-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2010_L7DO75H_UnitER_AN.GRF	AERMOD generated plot file for 2010 annual impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2010_L7DO50H_UnitER_1Hr.GRF	AERMOD generated plot file for 2010 1-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2010_L7DO50H_UnitER_3Hr.GRF	AERMOD generated plot file for 2010 3-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2010_L7DO50H_UnitER_8Hr.GRF	AERMOD generated plot file for 2010 8-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2010_L7DO50H_UnitER_24Hr.GRF	AERMOD generated plot file for 2010 24-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2010_L7DO50H_UnitER_AN.GRF	AERMOD generated plot file for 2010 annual impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2011_UnitER.inp	AERMOD input file for 2011 with unit emission rates for steady state conditions
	Linden7_2011_UnitER.out	AERMOD output file for 2011 with unit emission rates for steady state conditions
	Linden7_2011_L7NG100L_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
	Linden7_2011_L7NG100L_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
	Linden7_2011_L7NG100L_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
	Linden7_2011_L7NG100L_UnitER_24Hr.GRF	AERMOD generated plot file for 2011 24-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
	Linden7_2011_L7NG100L_UnitER_AN.GRF	AERMOD generated plot file for 2011 annual impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
	Linden7_2011_L7NG75L_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Natural Gas at 75% load during low ambient temperatures

Subdirectory	File Name	Description
	Linden7_2011_L7NG75L_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Natural Gas at 75% load during low ambient temperatures
	Linden7_2011_L7NG75L_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Natural Gas at 75% load during low ambient temperatures
	Linden7_2011_L7NG75L_UnitER_24Hr.GRF	AERMOD generated plot file for 2011 24-hour impacts with unit emission rates while firing Natural Gas at 75% load during low ambient temperatures
	Linden7_2011_L7NG75L_UnitER_AN.GRF	AERMOD generated plot file for 2011 annual impacts with unit emission rates while firing Natural Gas at 75% load during low ambient temperatures
	Linden7_2011_L7NG50L_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2011_L7NG50L_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2011_L7NG50L_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2011_L7NG50L_UnitER_24Hr.GRF	AERMOD generated plot file for 2011 24-hour impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2011_L7NG50L_UnitER_AN.GRF	AERMOD generated plot file for 2011 annual impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2011_L7NG100M_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
	Linden7_2011_L7NG100M_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
	Linden7_2011_L7NG100M_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
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Subdirectory	File Name	Description
	Linden7_2011_L7NG100M_UnitER_AN.GRF	AERMOD generated plot file for 2011 annual impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
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	Linden7_2011_L7NG75M_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Natural Gas at 75% load during medium ambient temperatures
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	Linden7_2011_L7NG50M_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2011_L7NG50M_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2011_L7NG50M_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2011_L7NG50M_UnitER_24Hr.GRF	AERMOD generated plot file for 2011 24-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2011_L7NG50M_UnitER_AN.GRF	AERMOD generated plot file for 2011 annual impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures

Subdirectory	File Name	Description
	Linden7_2011_L7NG100H_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2011_L7NG100H_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2011_L7NG100H_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2011_L7NG100H_UnitER_24Hr.GRF	AERMOD generated plot file for 2011 24-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
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	Linden7_2011_L7NG50H_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2011_L7NG50H_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2011_L7NG50H_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2011_L7NG50H_UnitER_24Hr.GRF	AERMOD generated plot file for 2011 24-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures

Subdirectory	File Name	Description
	Linden7_2011_L7NG50H_UnitER_AN.GRF	AERMOD generated plot file for 2011 annual impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2011_L7DO100L_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2011_L7DO100L_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2011_L7DO100L_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2011_L7DO100L_UnitER_24Hr.GRF	AERMOD generated plot file for 2011 24-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2011_L7DO100L_UnitER_AN.GRF	AERMOD generated plot file for 2011 annual impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2011_L7DO75L_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2011_L7DO75L_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2011_L7DO75L_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2011_L7DO75L_UnitER_24Hr.GRF	AERMOD generated plot file for 2011 24-hour impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2011_L7DO75L_UnitER_AN.GRF	AERMOD generated plot file for 2011 annual impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2011_L7DO50L_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2011_L7DO50L_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2011_L7DO50L_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures

Subdirectory	File Name	Description
	Linden7_2011_L7DO50L_UnitER_24Hr.GRF	AERMOD generated plot file for 2011 24-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2011_L7DO50L_UnitER_AN.GRF	AERMOD generated plot file for 2011 annual impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2011_L7DO100M_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2011_L7DO100M_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2011_L7DO100M_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2011_L7DO100M_UnitER_24Hr.GRF	AERMOD generated plot file for 2011 24-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2011_L7DO100M_UnitER_AN.GRF	AERMOD generated plot file for 2011 annual impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
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	Linden7_2011_L7DO75M_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2011_L7DO75M_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
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Subdirectory	File Name	Description
	Linden7_2011_L7DO75M_UnitER_AN.GRF	AERMOD generated plot file for 2011 annual impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2011_L7DO50M_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2011_L7DO50M_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2011_L7DO50M_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
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	Linden7_2011_L7DO50M_UnitER_AN.GRF	AERMOD generated plot file for 2011 annual impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2011_L7DO100H_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2011_L7DO100H_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2011_L7DO100H_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2011_L7DO100H_UnitER_24Hr.GRF	AERMOD generated plot file for 2011 24-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2011_L7DO100H_UnitER_AN.GRF	AERMOD generated plot file for 2011 annual impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2011_L7DO75H_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures

Subdirectory	File Name	Description
	Linden7_2011_L7DO75H_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2011_L7DO75H_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2011_L7DO75H_UnitER_24Hr.GRF	AERMOD generated plot file for 2011 24-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2011_L7DO75H_UnitER_AN.GRF	AERMOD generated plot file for 2011 annual impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2011_L7DO50H_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2011_L7DO50H_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2011_L7DO50H_UnitER_8Hr.GRF	AERMOD generated plot file for 2011 8-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
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	Linden7_2011_L7DO50H_UnitER_AN.GRF	AERMOD generated plot file for 2011 annual impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2012_UnitER.inp	AERMOD input file for 2012 with unit emission rates for steady state conditions
	Linden7_2012_UnitER.out	AERMOD output file for 2012 with unit emission rates for steady state conditions
	Linden7_2012_L7NG100L_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
	Linden7_2012_L7NG100L_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
	Linden7_2012_L7NG100L_UnitER_8Hr.GRF	AERMOD generated plot file for 2012 8-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
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	Linden7_2012_L7NG50L_UnitER_AN.GRF	AERMOD generated plot file for 2012 annual impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2012_L7NG100M_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
	Linden7_2012_L7NG100M_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures

Subdirectory	File Name	Description
	Linden7_2012_L7NG100M_UnitER_8Hr.GRF	AERMOD generated plot file for 2012 8-hour impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
	Linden7_2012_L7NG100M_UnitER_24Hr.GRF	AERMOD generated plot file for 2012 24-hour impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
	Linden7_2012_L7NG100M_UnitER_AN.GRF	AERMOD generated plot file for 2012 annual impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
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	Linden7_2012_L7NG50M_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2012_L7NG50M_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2012_L7NG50M_UnitER_8Hr.GRF	AERMOD generated plot file for 2012 8-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures

Subdirectory	File Name	Description
	Linden7_2012_L7NG50M_UnitER_24Hr.GRF	AERMOD generated plot file for 2012 24-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2012_L7NG50M_UnitER_AN.GRF	AERMOD generated plot file for 2012 annual impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2012_L7NG100H_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2012_L7NG100H_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2012_L7NG100H_UnitER_8Hr.GRF	AERMOD generated plot file for 2012 8-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2012_L7NG100H_UnitER_24Hr.GRF	AERMOD generated plot file for 2012 24-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2012_L7NG100H_UnitER_AN.GRF	AERMOD generated plot file for 2012 annual impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2012_L7NG75H_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2012_L7NG75H_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2012_L7NG75H_UnitER_8Hr.GRF	AERMOD generated plot file for 2012 8-hour impacts with unit emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2012_L7NG75H_UnitER_24Hr.GRF	AERMOD generated plot file for 2012 24-hour impacts with unit emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2012_L7NG75H_UnitER_AN.GRF	AERMOD generated plot file for 2012 annual impacts with unit emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2012_L7NG50H_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2012_L7NG50H_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures

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Subdirectory	File Name	Description
	Linden7_2012_L7NG50H_UnitER_8Hr.GRF	AERMOD generated plot file for 2012 8-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2012_L7NG50H_UnitER_24Hr.GRF	AERMOD generated plot file for 2012 24-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2012_L7NG50H_UnitER_AN.GRF	AERMOD generated plot file for 2012 annual impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2012_L7DO100L_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2012_L7DO100L_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2012_L7DO100L_UnitER_8Hr.GRF	AERMOD generated plot file for 2012 8-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2012_L7DO100L_UnitER_24Hr.GRF	AERMOD generated plot file for 2012 24-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2012_L7DO100L_UnitER_AN.GRF	AERMOD generated plot file for 2012 annual impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2012_L7DO75L_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2012_L7DO75L_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2012_L7DO75L_UnitER_8Hr.GRF	AERMOD generated plot file for 2012 8-hour impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2012_L7DO75L_UnitER_24Hr.GRF	AERMOD generated plot file for 2012 24-hour impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2012_L7DO75L_UnitER_AN.GRF	AERMOD generated plot file for 2012 annual impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2012_L7DO50L_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures

Subdirectory	File Name	Description
	Linden7_2012_L7DO50L_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2012_L7DO50L_UnitER_8Hr.GRF	AERMOD generated plot file for 2012 8-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2012_L7DO50L_UnitER_24Hr.GRF	AERMOD generated plot file for 2012 24-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2012_L7DO50L_UnitER_AN.GRF	AERMOD generated plot file for 2012 annual impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2012_L7DO100M_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2012_L7DO100M_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2012_L7DO100M_UnitER_8Hr.GRF	AERMOD generated plot file for 2012 8-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2012_L7DO100M_UnitER_24Hr.GRF	AERMOD generated plot file for 2012 24-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2012_L7DO100M_UnitER_AN.GRF	AERMOD generated plot file for 2012 annual impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2012_L7DO75M_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2012_L7DO75M_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2012_L7DO75M_UnitER_8Hr.GRF	AERMOD generated plot file for 2012 8-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures

Subdirectory	File Name	Description
	Linden7_2012_L7DO75M_UnitER_24Hr.GRF	AERMOD generated plot file for 2012 24-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2012_L7DO75M_UnitER_AN.GRF	AERMOD generated plot file for 2012 annual impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2012_L7DO50M_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2012_L7DO50M_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
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	Linden7_2012_L7DO100H_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2012_L7DO100H_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
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	Linden7_2012_L7DO100H_UnitER_24Hr.GRF	AERMOD generated plot file for 2012 24-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2012_L7DO100H_UnitER_AN.GRF	AERMOD generated plot file for 2012 annual impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures

Subdirectory	File Name	Description
	Linden7_2012_L7DO75H_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2012_L7DO75H_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2012_L7DO75H_UnitER_8Hr.GRF	AERMOD generated plot file for 2012 8-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2012_L7DO75H_UnitER_24Hr.GRF	AERMOD generated plot file for 2012 24-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2012_L7DO75H_UnitER_AN.GRF	AERMOD generated plot file for 2012 annual impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2012_L7DO50H_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2012_L7DO50H_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2012_L7DO50H_UnitER_8Hr.GRF	AERMOD generated plot file for 2012 8-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2012_L7DO50H_UnitER_24Hr.GRF	AERMOD generated plot file for 2012 24-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2012_L7DO50H_UnitER_AN.GRF	AERMOD generated plot file for 2012 annual impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2013_UnitER.inp	AERMOD input file for 2013 with unit emission rates for steady state conditions
	Linden7_2013_UnitER.out	AERMOD output file for 2013 with unit emission rates for steady state conditions
	Linden7_2013_L7NG100L_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
	Linden7_2013_L7NG100L_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
	Linden7_2013_L7NG100L_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures

Subdirectory	File Name	Description
	Linden7_2013_L7NG100L_UnitER_24Hr.GRF	AERMOD generated plot file for 2013 24-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
	Linden7_2013_L7NG100L_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
	Linden7_2013_L7NG75L_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Natural Gas at 75% load during low ambient temperatures
	Linden7_2013_L7NG75L_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Natural Gas at 75% load during low ambient temperatures
	Linden7_2013_L7NG75L_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Natural Gas at 75% load during low ambient temperatures
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	Linden7_2013_L7NG50L_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2013_L7NG50L_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2013_L7NG50L_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2013_L7NG50L_UnitER_24Hr.GRF	AERMOD generated plot file for 2013 24-hour impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2013_L7NG50L_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2013_L7NG100M_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
	Linden7_2013_L7NG100M_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures

Subdirectory	File Name	Description
	Linden7_2013_L7NG100M_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
	Linden7_2013_L7NG100M_UnitER_24Hr.GRF	AERMOD generated plot file for 2013 24-hour impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
	Linden7_2013_L7NG100M_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
	Linden7_2013_L7NG75M_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Natural Gas at 75% load during medium ambient temperatures
	Linden7_2013_L7NG75M_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Natural Gas at 75% load during medium ambient temperatures
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	Linden7_2013_L7NG75M_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Natural Gas at 75% load during medium ambient temperatures
	Linden7_2013_L7NG50M_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2013_L7NG50M_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2013_L7NG50M_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures

Subdirectory	File Name	Description
	Linden7_2013_L7NG50M_UnitER_24Hr.GRF	AERMOD generated plot file for 2013 24-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2013_L7NG50M_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2013_L7NG100H_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2013_L7NG100H_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2013_L7NG100H_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2013_L7NG100H_UnitER_24Hr.GRF	AERMOD generated plot file for 2013 24-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2013_L7NG100H_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2013_L7NG75H_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2013_L7NG75H_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2013_L7NG75H_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2013_L7NG75H_UnitER_24Hr.GRF	AERMOD generated plot file for 2013 24-hour impacts with unit emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2013_L7NG75H_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2013_L7NG50H_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2013_L7NG50H_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures

Subdirectory	File Name	Description
	Linden7_2013_L7NG50H_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2013_L7NG50H_UnitER_24Hr.GRF	AERMOD generated plot file for 2013 24-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2013_L7NG50H_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2013_L7DO100L_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2013_L7DO100L_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2013_L7DO100L_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2013_L7DO100L_UnitER_24Hr.GRF	AERMOD generated plot file for 2013 24-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2013_L7DO100L_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
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	Linden7_2013_L7DO75L_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2013_L7DO75L_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2013_L7DO75L_UnitER_24Hr.GRF	AERMOD generated plot file for 2013 24-hour impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2013_L7DO75L_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2013_L7DO50L_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures

Subdirectory	File Name	Description
	Linden7_2013_L7DO50L_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2013_L7DO50L_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2013_L7DO50L_UnitER_24Hr.GRF	AERMOD generated plot file for 2013 24-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2013_L7DO50L_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2013_L7DO100M_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2013_L7DO100M_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2013_L7DO100M_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
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	Linden7_2013_L7DO100M_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
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	Linden7_2013_L7DO75M_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2013_L7DO75M_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures

Subdirectory	File Name	Description
	Linden7_2013_L7DO75M_UnitER_24Hr.GRF	AERMOD generated plot file for 2013 24-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2013_L7DO75M_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
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	Linden7_2013_L7DO50M_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2013_L7DO100H_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2013_L7DO100H_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2013_L7DO100H_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2013_L7DO100H_UnitER_24Hr.GRF	AERMOD generated plot file for 2013 24-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2013_L7DO100H_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures

Subdirectory	File Name	Description
	Linden7_2013_L7DO75H_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2013_L7DO75H_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2013_L7DO75H_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2013_L7DO75H_UnitER_24Hr.GRF	AERMOD generated plot file for 2013 24-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2013_L7DO75H_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2013_L7DO50H_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2013_L7DO50H_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2013_L7DO50H_UnitER_8Hr.GRF	AERMOD generated plot file for 2013 8-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2013_L7DO50H_UnitER_24Hr.GRF	AERMOD generated plot file for 2013 24-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2013_L7DO50H_UnitER_AN.GRF	AERMOD generated plot file for 2013 annual impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2014_UnitER.inp	AERMOD input file for 2014 with unit emission rates for steady state conditions
	Linden7_2014_UnitER.out	AERMOD output file for 2014 with unit emission rates for steady state conditions
	Linden7_2014_L7NG100L_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
	Linden7_2014_L7NG100L_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
	Linden7_2014_L7NG100L_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures

Subdirectory	File Name	Description
	Linden7_2014_L7NG100L_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
	Linden7_2014_L7NG100L_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Natural Gas at 100% load during low ambient temperatures
	Linden7_2014_L7NG75L_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Natural Gas at 75% load during low ambient temperatures
	Linden7_2014_L7NG75L_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Natural Gas at 75% load during low ambient temperatures
	Linden7_2014_L7NG75L_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Natural Gas at 75% load during low ambient temperatures
	Linden7_2014_L7NG75L_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Natural Gas at 75% load during low ambient temperatures
	Linden7_2014_L7NG75L_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Natural Gas at 75% load during low ambient temperatures
	Linden7_2014_L7NG50L_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2014_L7NG50L_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2014_L7NG50L_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2014_L7NG50L_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2014_L7NG50L_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2014_L7NG100M_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
	Linden7_2014_L7NG100M_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures

Subdirectory	File Name	Description
	Linden7_2014_L7NG100M_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
	Linden7_2014_L7NG100M_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
	Linden7_2014_L7NG100M_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Natural Gas at 100% load during medium ambient temperatures
	Linden7_2014_L7NG75M_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Natural Gas at 75% load during medium ambient temperatures
	Linden7_2014_L7NG75M_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Natural Gas at 75% load during medium ambient temperatures
	Linden7_2014_L7NG75M_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Natural Gas at 75% load during medium ambient temperatures
	Linden7_2014_L7NG75M_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Natural Gas at 75% load during medium ambient temperatures
	Linden7_2014_L7NG75M_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Natural Gas at 75% load during medium ambient temperatures
	Linden7_2014_L7NG50M_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2014_L7NG50M_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2014_L7NG50M_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures

Subdirectory	File Name	Description
	Linden7_2014_L7NG50M_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2014_L7NG50M_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2014_L7NG100H_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2014_L7NG100H_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2014_L7NG100H_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2014_L7NG100H_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2014_L7NG100H_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2014_L7NG75H_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2014_L7NG75H_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2014_L7NG75H_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2014_L7NG75H_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2014_L7NG75H_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2014_L7NG50H_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2014_L7NG50H_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures

Subdirectory	File Name	Description
	Linden7_2014_L7NG50H_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2014_L7NG50H_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2014_L7NG50H_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2014_L7DO100L_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2014_L7DO100L_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2014_L7DO100L_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2014_L7DO100L_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2014_L7DO100L_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2014_L7DO75L_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2014_L7DO75L_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2014_L7DO75L_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2014_L7DO75L_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2014_L7DO75L_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2014_L7DO50L_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures

Subdirectory	File Name	Description
	Linden7_2014_L7DO50L_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2014_L7DO50L_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2014_L7DO50L_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2014_L7DO50L_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Distillate Oil at 50% load during low ambient temperatures
	Linden7_2014_L7DO100M_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2014_L7DO100M_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2014_L7DO100M_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2014_L7DO100M_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2014_L7DO100M_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2014_L7DO75M_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2014_L7DO75M_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2014_L7DO75M_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures

Subdirectory	File Name	Description
	Linden7_2014_L7DO75M_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2014_L7DO75M_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2014_L7DO50M_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2014_L7DO50M_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2014_L7DO50M_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2014_L7DO50M_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2014_L7DO50M_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2014_L7DO100H_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2014_L7DO100H_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2014_L7DO100H_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2014_L7DO100H_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2014_L7DO100H_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Distillate Oil at 100% load during high ambient temperatures

Subdirectory	File Name	Description
	Linden7_2014_L7DO75H_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2014_L7DO75H_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2014_L7DO75H_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2014_L7DO75H_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2014_L7DO75H_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2014_L7DO50H_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2014_L7DO50H_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2014_L7DO50H_UnitER_8Hr.GRF	AERMOD generated plot file for 2014 8-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2014_L7DO50H_UnitER_24Hr.GRF	AERMOD generated plot file for 2014 24-hour impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
	Linden7_2014_L7DO50H_UnitER_AN.GRF	AERMOD generated plot file for 2014 annual impacts with unit emission rates while firing Distillate Oil at 50% load during high ambient temperatures
UnitEmissionSUSD	Linden7_2010_UnitER_SUSD.inp	AERMOD input file for 2010 with unit emission rates for startup/shutdown conditions
	Linden7_2010_UnitER_SUSD.out	AERMOD output file for 2010 with unit emission rates for startup/shutdown conditions
	Linden7_2010_L7NG_CS_UnitER_1Hr.GRF	AERMOD generated plot file for 2010 1-hour impacts with unit emission rates while firing Natural Gas during cold start
	Linden7_2010_L7NG_CS_UnitER_3Hr.GRF	AERMOD generated plot file for 2010 3-hour impacts with unit emission rates while firing Natural Gas during cold start
	Linden7_2010_L7NG_WS_UnitER_1Hr.GRF	AERMOD generated plot file for 2010 1-hour impacts with unit emission rates while firing Natural Gas during warm start

Subdirectory	File Name	Description
	Linden7_2010_L7NG_WS_UnitER_3Hr.GRF	AERMOD generated plot file for 2010 3-hour impacts with unit emission rates while firing Natural Gas during warm start
	Linden7_2010_L7NG_HS_UnitER_1Hr.GRF	AERMOD generated plot file for 2010 1-hour impacts with unit emission rates while firing Natural Gas during hot start
	Linden7_2010_L7NG_HS_UnitER_3Hr.GRF	AERMOD generated plot file for 2010 3-hour impacts with unit emission rates while firing Natural Gas during hot start
	Linden7_2010_L7NG_SD_UnitER_1Hr.GRF	AERMOD generated plot file for 2010 1-hour impacts with unit emission rates while firing Natural Gas during shutdown
	Linden7_2010_L7NG_SD_UnitER_3Hr.GRF	AERMOD generated plot file for 2010 3-hour impacts with unit emission rates while firing Natural Gas during shutdown
	Linden7_2010_L7DO_CS_UnitER_1Hr.GRF	AERMOD generated plot file for 2010 1-hour impacts with unit emission rates while firing Distillate Oil during cold start
	Linden7_2010_L7DO_CS_UnitER_3Hr.GRF	AERMOD generated plot file for 2010 3-hour impacts with unit emission rates while firing Distillate Oil during cold start
	Linden7_2010_L7DO_WS_UnitER_1Hr.GRF	AERMOD generated plot file for 2010 1-hour impacts with unit emission rates while firing Distillate Oil during warm start
	Linden7_2010_L7DO_WS_UnitER_3Hr.GRF	AERMOD generated plot file for 2010 3-hour impacts with unit emission rates while firing Distillate Oil during warm start
	Linden7_2010_L7DO_HS_UnitER_1Hr.GRF	AERMOD generated plot file for 2010 1-hour impacts with unit emission rates while firing Distillate Oil during hot start
	Linden7_2010_L7DO_HS_UnitER_3Hr.GRF	AERMOD generated plot file for 2010 3-hour impacts with unit emission rates while firing Distillate Oil during hot start
	Linden7_2010_L7DO_SD_UnitER_1Hr.GRF	AERMOD generated plot file for 2010 1-hour impacts with unit emission rates while firing Distillate Oil during shutdown
	Linden7_2010_L7DO_SD_UnitER_3Hr.GRF	AERMOD generated plot file for 2010 3-hour impacts with unit emission rates while firing Distillate Oil during shutdown
	Linden7_2011_UnitER_SUSD.inp	AERMOD input file for 2011 with unit emission rates for startup/shutdown conditions
	Linden7_2011_UnitER_SUSD.out	AERMOD output file for 2011 with unit emission rates for startup/shutdown conditions

Subdirectory	File Name	Description
	Linden7_2011_L7NG_CS_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Natural Gas during cold start
	Linden7_2011_L7NG_CS_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Natural Gas during cold start
	Linden7_2011_L7NG_WS_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Natural Gas during warm start
	Linden7_2011_L7NG_WS_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Natural Gas during warm start
	Linden7_2011_L7NG_HS_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Natural Gas during hot start
	Linden7_2011_L7NG_HS_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Natural Gas during hot start
	Linden7_2011_L7NG_SD_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Natural Gas during shutdown
	Linden7_2011_L7NG_SD_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Natural Gas during shutdown
	Linden7_2011_L7DO_CS_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Distillate Oil during cold start
	Linden7_2011_L7DO_CS_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Distillate Oil during cold start
	Linden7_2011_L7DO_WS_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Distillate Oil during warm start
	Linden7_2011_L7DO_WS_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Distillate Oil during warm start
	Linden7_2011_L7DO_HS_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Distillate Oil during hot start
	Linden7_2011_L7DO_HS_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Distillate Oil during hot start

Subdirectory	File Name	Description
	Linden7_2011_L7DO_SD_UnitER_1Hr.GRF	AERMOD generated plot file for 2011 1-hour impacts with unit emission rates while firing Distillate Oil during shutdown
	Linden7_2011_L7DO_SD_UnitER_3Hr.GRF	AERMOD generated plot file for 2011 3-hour impacts with unit emission rates while firing Distillate Oil during shutdown
	Linden7_2012_UnitER_SUSD.inp	AERMOD input file for 2012 with unit emission rates for startup/shutdown conditions
	Linden7_2012_UnitER_SUSD.out	AERMOD output file for 2012 with unit emission rates for startup/shutdown conditions
	Linden7_2012_L7NG_CS_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Natural Gas during cold start
	Linden7_2012_L7NG_CS_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Natural Gas during cold start
	Linden7_2012_L7NG_WS_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Natural Gas during warm start
	Linden7_2012_L7NG_WS_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Natural Gas during warm start
	Linden7_2012_L7NG_HS_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Natural Gas during hot start
	Linden7_2012_L7NG_HS_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Natural Gas during hot start
	Linden7_2012_L7NG_SD_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Natural Gas during shutdown
	Linden7_2012_L7NG_SD_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Natural Gas during shutdown
	Linden7_2012_L7DO_CS_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Distillate Oil during cold start
	Linden7_2012_L7DO_CS_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Distillate Oil during cold start
	Linden7_2012_L7DO_WS_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Distillate Oil during warm start

Subdirectory	File Name	Description
	Linden7_2012_L7DO_WS_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Distillate Oil during warm start
	Linden7_2012_L7DO_HS_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Distillate Oil during hot start
	Linden7_2012_L7DO_HS_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Distillate Oil during hot start
	Linden7_2012_L7DO_SD_UnitER_1Hr.GRF	AERMOD generated plot file for 2012 1-hour impacts with unit emission rates while firing Distillate Oil during shutdown
	Linden7_2012_L7DO_SD_UnitER_3Hr.GRF	AERMOD generated plot file for 2012 3-hour impacts with unit emission rates while firing Distillate Oil during shutdown
	Linden7_2013_UnitER_SUSD.inp	AERMOD input file for 2013 with unit emission rates for startup/shutdown conditions
	Linden7_2013_UnitER_SUSD.out	AERMOD output file for 2013 with unit emission rates for startup/shutdown conditions
	Linden7_2013_L7NG_CS_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Natural Gas during cold start
	Linden7_2013_L7NG_CS_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Natural Gas during cold start
	Linden7_2013_L7NG_WS_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Natural Gas during warm start
	Linden7_2013_L7NG_WS_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Natural Gas during warm start
	Linden7_2013_L7NG_HS_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Natural Gas during hot start
	Linden7_2013_L7NG_HS_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Natural Gas during hot start
	Linden7_2013_L7NG_SD_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Natural Gas during shutdown
	Linden7_2013_L7NG_SD_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Natural Gas during shutdown

Subdirectory	File Name	Description
	Linden7_2013_L7DO_CS_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Distillate Oil during cold start
	Linden7_2013_L7DO_CS_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Distillate Oil during cold start
	Linden7_2013_L7DO_WS_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Distillate Oil during warm start
	Linden7_2013_L7DO_WS_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Distillate Oil during warm start
	Linden7_2013_L7DO_HS_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Distillate Oil during hot start
	Linden7_2013_L7DO_HS_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Distillate Oil during hot start
	Linden7_2013_L7DO_SD_UnitER_1Hr.GRF	AERMOD generated plot file for 2013 1-hour impacts with unit emission rates while firing Distillate Oil during shutdown
	Linden7_2013_L7DO_SD_UnitER_3Hr.GRF	AERMOD generated plot file for 2013 3-hour impacts with unit emission rates while firing Distillate Oil during shutdown
	Linden7_2014_UnitER_SUSD.inp	AERMOD input file for 2014 with unit emission rates for startup/shutdown conditions
	Linden7_2014_UnitER_SUSD.out	AERMOD output file for 2014 with unit emission rates for startup/shutdown conditions
	Linden7_2014_L7NG_CS_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Natural Gas during cold start
	Linden7_2014_L7NG_CS_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Natural Gas during cold start
	Linden7_2014_L7NG_WS_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Natural Gas during warm start
	Linden7_2014_L7NG_WS_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Natural Gas during warm start
	Linden7_2014_L7NG_HS_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Natural Gas during hot start

Subdirectory	File Name	Description
	Linden7_2014_L7NG_HS_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Natural Gas during hot start
	Linden7_2014_L7NG_SD_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Natural Gas during shutdown
	Linden7_2014_L7NG_SD_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Natural Gas during shutdown
	Linden7_2014_L7DO_CS_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Distillate Oil during cold start
	Linden7_2014_L7DO_CS_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Distillate Oil during cold start
	Linden7_2014_L7DO_WS_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Distillate Oil during warm start
	Linden7_2014_L7DO_WS_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Distillate Oil during warm start
	Linden7_2014_L7DO_HS_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Distillate Oil during hot start
	Linden7_2014_L7DO_HS_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Distillate Oil during hot start
	Linden7_2014_L7DO_SD_UnitER_1Hr.GRF	AERMOD generated plot file for 2014 1-hour impacts with unit emission rates while firing Distillate Oil during shutdown
	Linden7_2014_L7DO_SD_UnitER_3Hr.GRF	AERMOD generated plot file for 2014 3-hour impacts with unit emission rates while firing Distillate Oil during shutdown
PM2_5 SS	Linden7_2010-2014_PM2_5_24Hr.INP	AERMOD input file for 2010-2014 concatenated met data with maximum emission rates for steady state conditions
	Linden7_2010-2014_PM2_5_24Hr.OUT	AERMOD output file for 2010-2014 concatenated met data with maximum emission rates for steady state conditions
	Linden7_2010-2014_L7NG100L_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Natural Gas at 100% load during low ambient temperatures

Subdirectory	File Name	Description
	Linden7_2010-2014_L7NG75L_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Natural Gas at 75% load during low ambient temperatures
	Linden7_2010-2014_L7NG50L_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Natural Gas at 50% load during low ambient temperatures
	Linden7_2010-2014_L7NG100M_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Natural Gas at 100% load during medium ambient temperatures
	Linden7_2010-2014_L7NG75M_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Natural Gas at 75% load during medium ambient temperatures
	Linden7_2010-2014_L7NG50M_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Natural Gas at 50% load during medium ambient temperatures
	Linden7_2010-2014_L7NG100H_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Natural Gas at 100% load during high ambient temperatures
	Linden7_2010-2014_L7NG75H_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Natural Gas at 75% load during high ambient temperatures
	Linden7_2010-2014_L7NG50H_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Natural Gas at 50% load during high ambient temperatures
	Linden7_2010-2014_L7DO100L_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Distillate Oil at 100% load during low ambient temperatures
	Linden7_2010-2014_L7DO75L_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Distillate Oil at 75% load during low ambient temperatures
	Linden7_2010-2014_L7DO50L_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Distillate Oil at 50% load during low ambient temperatures

Subdirectory	File Name	Description
	Linden7_2010-2014_L7DO100M_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Distillate Oil at 100% load during medium ambient temperatures
	Linden7_2010-2014_L7DO75M_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Distillate Oil at 75% load during medium ambient temperatures
	Linden7_2010-2014_L7DO50M_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Distillate Oil at 50% load during medium ambient temperatures
	Linden7_2010-2014_L7DO100H_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Distillate Oil at 100% load during high ambient temperatures
	Linden7_2010-2014_L7DO75H_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Distillate Oil at 75% load during high ambient temperatures
	Linden7_2010-2014_L7DO50H_PM2_5_24Hr.GRF	AERMOD generated plot file for 2010-2014 24-hour 5-year average impacts with maximum emission rates while firing Distillate Oil at 50% load during high ambient temperatures
PM2_5 SUSD	Linden7_2010-2014_PM2_5_24Hr_SU_SD.INP	AERMOD input file for 2010-2014 concatenated met data with maximum PM2.5 emission rates for startup/shutdown conditions
	Linden7_2010-2014_PM2_5_24Hr_SU_SD.OUT	AERMOD output file for 2010-2014 concatenated met data with maximum PM2.5 emission rates for startup/shutdown conditions
	Linden7_2010-2014_PM2_5_L7NG_CS_wL7DO100M_24Hr.GRF	AERMOD generated plot file for 2010-2014 5-year average 24-hour impacts with maximum PM2.5 emission rates while firing Natural Gas during cold start
	Linden7_2010-2014_PM2_5_L7NG_WS_wL7DO100M_24Hr.GRF	AERMOD generated plot file for 2010-2014 5-year average 24-hour impacts with maximum PM2.5 emission rates while firing Natural Gas during warm start
	Linden7_2010-2014_PM2_5_L7NG_HS_wL7DO100M_24Hr.GRF	AERMOD generated plot file for 2010-2014 5-year average 24-hour impacts with maximum PM2.5 emission rates while firing Natural Gas during hot start

Subdirectory	File Name	Description
	Linden7_2010-2014_PM2_5_L7NG_SD_wL7DO100M_24Hr.GRF	AERMOD generated plot file for 2010-2014 5-year average 24-hour impacts with maximum PM2.5 emission rates while firing Natural Gas during shutdown
	Linden7_2010-2014_PM2_5_L7DO_CS_wL7DO100M_24Hr.GRF	AERMOD generated plot file for 2010-2014 5-year average 24-hour impacts with maximum PM2.5 emission rates while firing Distillate Oil during cold start
	Linden7_2010-2014_PM2_5_L7DO_WS_wL7DO100M_24Hr.GRF	AERMOD generated plot file for 2010-2014 5-year average 24-hour impacts with maximum PM2.5 emission rates while firing Distillate Oil during warm start
	Linden7_2010-2014_PM2_5_L7DO_HS_wL7DO100M_24Hr.GRF	AERMOD generated plot file for 2010-2014 5-year average 24-hour impacts with maximum PM2.5 emission rates while firing Distillate Oil during hot start
	Linden7_2010-2014_PM2_5_L7DO_SD_wL7DO100M_24Hr.GRF	AERMOD generated plot file for 2010-2014 5-year average 24-hour impacts with maximum PM2.5 emission rates while firing Distillate Oil during shutdown
VISCREEN	Linden7_VISCREEN_Level_2.OUT	VISCREEN generated output file
	Linden7_VISCREEN_Level_2.SUM	VISCREEN generated summary file
	Average wind speed towards Liberty Island.xslx	Excel spreadsheet to calculate average wind speed when wind is blowing from Linden 7 to Liberty Island
	READY Tools – Pasquill Stability Classes	Document used to determine stability classes from AERMOD met data
Downwash	Linden7BPIP.SUM	BPIP-PRM summary output file
	Linden7BPIP.INP	BPIP-PRM input file
	Linden7BPIP.OUT	BPIP-PRM output file
MetData	EWR_2010-2014.PFL	2010-2014 upper air meteorological data
	EWR_2010-2014.SCF	2010-2014 surface meteorological data
	EWR_2010.PFL	2010 upper air meteorological data
	EWR_2010.SCF	2010 surface meteorological data
	EWR_2011.PFL	2011 upper air meteorological data
	EWR_2011.SCF	2011 surface meteorological data
	EWR_2012.PFL	2012 upper air meteorological data
	EWR_2012.SCF	2012 surface meteorological data
	EWR_2013.PFL	2013 upper air meteorological data
	EWR_2013.SCF	2013 surface meteorological data
	EWR_2014.PFL	2014 upper air meteorological data
	EWR_2014.SCF	2014 surface meteorological data